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ABSTRACT

This publication contains instructional materials for teacher and student use for a course in information processing. The materials are written in terms of student performance using measurable objectives. The course includes 10 units. Each instructional unit contains some or all of the basic components of a unit of instruction: performance objectives, suggested activities for teachers and students, information sheets, job sheets, assignment sheets, visual aids, tests, and answers to the tests. Units are planned for more than one lesson or class period of instruction. Information for the teacher includes an instructional/occupational analysis of information processing and a glossary. Topics covered in the 10 units are the following: introduction to information processing; history; basic components of an information system; data representation/number systems; input/output devices and their media; methods of storing and retrieving information; understanding programming concepts and computer language; information processing systems; careers in information processing; and the present and the future of information processing. (KC)

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ED219647

INFORMATION PROCESSING

by

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and

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Developed by the

Mid-America Vocational Curriculum Consortium, Inc.

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FOREWORD

The Mid-America Vocational Curriculum Consortium (MAVCC) was organized for the purpose of developing instructional material for the eleven member states. Priorities for developing MAVCC material are determined annually based on the needs as identified by all member states. One priority identified was information processing. This publication is a part of a project designed to provide the basic instructional material for the areas of word and data processing.

The success of this publication is due, in large part, to the capabilities of the personnel who worked with its development. The technical writers have experience as teachers as well as with industry. Assisting them in their efforts were representatives of each of the member states who brought with them technical expertise and the experience related to the classroom and to the trade. To assure that the materials would parallel the industry environment and be accepted as a transportable basic teaching tool, organizations and industry representatives were involved in the developmental phases of the manual. Appreciation is extended to them for their valuable contributions to the manual.

This publication is designed to assist teachers in improving instruction. As these publications are used, it is hoped that the student performance will improve and that students will be better able to assume a role in their chosen occupation.

Instructional materials in this publication are written in terms of student performance using measurable objectives. This is an innovative approach to teaching that accents and augments the teaching/learning process. Criterion referenced evaluation instruments are provided for uniform measurement of student progress. In addition to evaluating recall information, teachers are encouraged to evaluate the other areas including process and product as indicated at the end of each instructional unit.

It is the sincere belief of the MAVCC personnel and all those members who served on the committees that this publication will allow the students to become better prepared and more effective members of the work force.

David Merrill, Chairman
Board of Directors
Mid-America Vocational
Curriculum Consortium

PREFACE

For many years those responsible for teaching in both word and data processing programs have felt a need for instructional materials which could teach the basic concepts. A team of teachers, industry representatives, and business and office education staff members accepted this challenge and have produced a manual which will meet the needs of many types of courses where students are expected to become proficient in the area of information processing. The MAVCC *Information Processing* publication is designed to include the basic information needed to be able to attain that proficiency.

As with all efforts of this nature, feedback from the instructors selected to field test these curriculum materials greatly assisted MAVCC in evaluating its efforts and contributed significantly to the materials development. For their efforts, MAVCC expresses appreciation.

Every effort has been made to make this publication basic, readable and by all means usable. Three vital parts of instruction have been intentionally omitted from this publication: motivation, personalization, and localization. These areas are left to the individual instructors and the instructors should capitalize on them. Only then will this publication really become a vital part of the teaching-learning process.

As you use this publication, we hope that you will find that it contributes to the quality of your program. If any problems occur, or if you have suggestions for the improvement of the materials, we encourage you to call or write us.

Ann Benson
Executive Director
Mid-America Vocational
Curriculum Consortium, Inc.

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The contents of this publication were planned and reviewed by:

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USE OF THIS PUBLICATION

Instructional Units

Information Processing includes 10 units. Each instructional unit includes some or all of the basic components of a unit of instruction: performance objectives, suggested activities for teachers and students, information sheets, assignment sheets, visual aids, tests, and answers to the test. Units are planned for more than one lesson or class period of instruction.

Careful study of each instructional unit by the teacher will help to determine:

- A. The amount of material that can be covered in each class period
- B. The skills which must be demonstrated
  - 1. Supplies needed
  - 2. Equipment needed
  - 3. Amount of practice needed
  - 4. Amount of class time needed for demonstrations
- C. Supplementary materials such as pamphlets or filmstrips that must be ordered
- D. Resource people who must be contacted

Objectives

Each unit of instruction is based on performance objectives. These objectives state the goals of the course, thus providing a sense of direction and accomplishment for the student.

Performance objectives are stated in two forms: unit objectives, stating the subject matter to be covered in a unit of instruction; and specific objectives, stating the student performance necessary to reach the unit objective.

Since the objectives of the unit provide direction for the teaching-learning process, it is important for the teacher and students to have a common understanding of the intent of the objectives. A limited number of performance terms have been used in the objectives for this curriculum to assist in promoting the effectiveness of the communication among all individuals using the materials.

Following is a list of performance terms and their synonyms which may have been used in this material:

Name
Label
List in writing
List orally
Letter
Record
Repeat
Give

Identify
Select
Mark
Point out
Pick out
Choose
Locate

Describe
Define
Discuss in writing
Discuss orally
Interpret
Tell how
Tell what
Explain

Order
Arrange
Sequence
List in order
Classify
Divide
Isolate
Sort

Distinguish
Discriminate

Construct
Draw
Make
Build
Design
Formulate
Reproduce
Transcribe
Reduce
Increase
Figure

Demonstrate
Show your work
Show procedure
Perform an experiment
Perform the steps
Operate
Remove
Replace
Turn off/on
(Dis) assemble
(Dis) connect

Additional Terms Used
Evaluate
Complete
Analyze
Calculate
Estimate
Plan
Observe
Compare
Determine
Perform

Prepare
Make
Read
Tell
Teach
Converse
Lead
State
Write

Reading of the objectives by the student should be followed by a class discussion to answer any questions concerning performance requirements for each instructional unit.

Teachers should feel free to add objectives which will fit the material to the needs of the students and community. When teachers add objectives, they should remember to supply the needed information, assignment and/or job sheets, and criterion tests.

Suggested Activities for the Instructor:

Each unit of instruction has a suggested activities sheet outlining steps to follow in accomplishing specific objectives. Duties of instructors will vary according to the particular unit; however, for best use of the material they should include the following: provide students with objective sheet, information sheet, assignment sheets, and job sheets; preview filmstrips, make transparencies, and arrange for resource materials and people; discuss unit and specific objectives and information sheet; give test. Teachers are encouraged to use any additional instructional activities and teaching methods to aid students in accomplishing the objectives.

Information Sheets

Information sheets provide content essential for meeting the cognitive (knowledge) objectives in the unit. The teacher will find that the information sheets serve as an excellent guide for presenting the background knowledge necessary to develop the skill specified in the unit objective.

Students should read the information sheets before the information is discussed in class. Students may take additional notes on the information sheets.

Transparency Masters

Transparency masters provide information in a special way. The students may see as well as hear the material being presented, thus reinforcing the learning process. Transparencies may present new information or they may reinforce information presented in the information sheets. They are particularly effective when identification is necessary.

Transparencies should be made and placed in the notebook where they will be immediately available for use. Transparencies direct the class's attention to the topic of discussion. They should be left on the screen only when topics shown are under discussion.

Job Sheets

Job sheets are an important segment of each unit. The instructor should be able to and in most situations should demonstrate the skills outlined in the job sheets. Procedures outlined in the job sheets give direction to the skill being taught and allow both student and teacher to check student progress toward the accomplishment of the skill. Job sheets provide a ready outline for students to follow if they have missed a demonstration. Job sheets also furnish potential employers with a picture of the skills being taught and the performances which might reasonably be expected from a person who has had this training.

Assignment Sheets

Assignment sheets give direction to study and furnish practice for paper and pencil activities to develop the knowledges which are necessary prerequisites to skill development. These may be given to the student for completion in class or used for homework assignments. Answer sheets are provided which may be used by the student and/or teacher for checking student progress.

Test and Evaluation

Paper-pencil and performance tests have been constructed to measure student achievement of each objective listed in the unit of instruction. Individual test items may be pulled out and used as a short test to determine student achievement of a particular objective. This kind of testing may be used as a daily quiz and will help the teacher spot difficulties being encountered by students in their efforts to accomplish the unit objective. Test items for objectives added by the teacher should be constructed and added to the test.

Test Answers

Test answers are provided for each unit. These may be used by the teacher and/or student for checking student achievement of the objectives.

INFORMATION PROCESSING

INSTRUCTIONAL/OCCUPATIONAL ANALYSIS

JOB TRAINING: What the Worker Should Be Able to Do (Psychomotor)	RELATED INFORMATION: What the Worker Should Know (Cognitive)
UNIT I: INTRODUCTION TO INFORMATION PROCESSING	
	1. Terms and definitions
	2. Types of hardware
	3. Primary needs
	4. Computer applications
	5. Ethics and confidentiality
6. Complete an attitude test concerning ethics and the confidentiality of information	
7. Conduct a business interview	
8. Unscramble information processing words	
UNIT II: HISTORY	
	1. Terms and definitions
	2. Inventors and inventions
	3. Four generations of computers
4. Complete a chart on the history of information processing	
UNIT III: BASIC COMPONENTS OF AN INFORMATION SYSTEM	
	1. Terms and definitions
	2. Label components
	3. Functions of control unit, main memory, and arithmetic/logic unit
	4. Process of flow
	5. Types of main memory
	6. Secondary storage
7. Sketch the configuration of a computer system	

JOB TRAINING: What the Worker Should Be Able to Do (Psychomotor)	RELATED INFORMATION: What the Worker Should Know (Cognitive)
8. Locate terms associated with the components of an information system	
9. Indicate the flow of data involved in the adding of six numbers and computing the average	
UNIT IV: DATA REPRESENTATION/NUMBER SYSTEMS	
	1. Terms and definitions
	2. Binary number systems
	3. Octal number systems
	4. Hexadecimal number systems
	5. Types of data code
6. Convert binary numbers to decimal numbers and decimal numbers to binary numbers	
7. Convert octal numbers to binary and decimal numbers and binary and decimal numbers to octal numbers	
8. Convert hexadecimal numbers to binary and decimal numbers and binary and decimal numbers to hexadecimal numbers	
9. Complete a crossword puzzle concerning data representation and number systems	
UNIT V: INPUT/OUTPUT DEVICES AND THEIR MEDIA	
	1. Terms and definitions
	2. Types of paper media
	3. Devices which use paper media
	4. Classify printing devices
	5. Types of magnetic media
	6. Types of keyboard devices
	7. Optical reading equipment
	8. Other input/output devices
9. Complete a crossword puzzle on printing devices	
10. Locate optical reading characters	
11. Dictate and transcribe information	

JOB TRAINING: What the Worker Should Be Able to Do (Psychomotor)

RELATED INFORMATION: What the Worker Should Know (Cognitive)

UNIT VI: METHODS OF STORING AND RETRIEVING INFORMATION

1. Terms and definitions
2. Components of data storage
3. Primary storage media
4. File organization
5. Complete a word search
6. Use an array
7. Prepare information for storing
8. Store information using a computer
9. Store and retrieve a letter
10. Prepare a report on the storage and retrieval of information

UNIT VII: UNDERSTANDING PROGRAMMING CONCEPTS AND COMPUTER LANGUAGE

1. Terms and definitions
2. Program development process
3. System flowcharting descriptions and symbols
4. Basic program flowcharting descriptions and symbols
5. Primary programming languages
6. Solve a problem using steps outlined in a flowchart
7. Complete a simple program flowchart
8. Construct a simple program flowchart

UNIT VIII: INFORMATION PROCESSING SYSTEMS

1. Terms and definitions
2. Off-line processing
3. On-line processing
4. Remote job entry systems

JOB TRAINING: What the Worker Should Be Able to Do (Psychomotor)	RELATED INFORMATION: What the Worker Should Know (Cognitive)
5. Complete a crossword puzzle using terms associated with information processing systems	

UNIT IX: CAREERS IN INFORMATION PROCESSING

	1. Terms and definitions
	2. Career positions on data processing chart
	3. Career positions on word processing chart
	4. Career titles and duties in data processing
	5. Career titles and duties in word processing
6. Draw an organizational chart of a data or word processing installation	
7. Respond to organizational questions	
8. Research a career area in information processing	
9. Evaluate employment skills	

UNIT X: INFORMATION PROCESSING: THE PRESENT AND THE FUTURE

	1. Terms and definitions
	2. Microprocessors
	3. Magnetic bubble memory
	4. Photodigital and holographic storage
	5. Fiber optics
	6. Voice processing systems
	7 Machine shorthand
	8. Electronic mail
	9. Cashless society
10. Match future trends with their characteristics	
11. Report on a future trend	

GLOSSARY

Access time--The amount of time necessary to locate and retrieve an item of data from secondary storage

Accounting applications--Computer applications such as payroll, accounts receivable, cost/revenue analysis, and loan accounting

Acoustic coupler--A special type of modem which allows a standard telephone headset to be attached to a terminal to allow the transmission of data

Administrative support system--Comprises all the nontyping tasks associated with tradiitonal secretarial work carried out under administrative supervision

American Standard Code for Information Interchange (ASCII)--A seven-bit code adopted as a standard to facilitate interchange of data between various machines and systems in teleprocessing environments

Arithmetic/logic unit--A major component of the central processing unit which performs all arithmetic and logical operations under the direction of the control unit

Array--A systematic arrangement of elements in a table format

Assembler--A computer program used to translate a program written in a symbolic programming language into a machine language program

Assembler language--A symbolic programming language that uses symbols and abbreviations to represent the function to be performed

Auxiliary storage device--A supplementary means for storing data

BASIC--A programming language developed at Dartmouth College for use in academic computing, but now widely used on personal computers and small business computers

Batch processing--The accumulation and processing of data as a group

Bill-O--Matic service--Service provided by banks in which a customer may use the telephone to communicate with the computer and to initial bill payments

Binary Coded Decimal (BCD)--A bit-pattern code used to represent data

Binary number system--A numeration system using the digits 0 and 1 and having a base of 2

Bit (binary digit)--The smallest unit of information that can be recognized by a computer

Blocking factor--The factor that indicates the number of records contained in one block of data on a magnetic tape

Byte--A storage unit; normally holds one character

Cashless society--Society in which cash is replaced by a credit-card type of medium for the recording of transactions

Cassette tape cartridge--Two reels of magnetic tape enclosed in a small plastic or metal cartridge

Cathode ray tube (CRT)--A vacuum tube with a screen and a controlled beam of electrons that may be used as a display or a storage device

Central processing unit (CPU)--The major component of a computer system, responsible for processing all data handled by the system; consists of the control unit, arithmetic/logic unit, and main memory

Check bit (parity bit)--A binary digit included in a pattern of bits to make the sum of all the 1 bits in the pattern either even or odd

Chips--Miniaturized integrated circuits which compose ROM memory

Clerical errors--Errors which occur in the coding of the program or when entering the coded program on some input device

COBOL--A high-level programming language designed to handle the data processing needs of business

Code--To translate and write information in a programming language

Compiler--A computer program used to translate high-level source language programs into machine language programs suitable for execution on a particular computing system

Computer aided transcription--Transcription of dictated material through the use of the central processing unit

Computer crime--The use of data processing equipment for fraud and extortion, and the malicious use or alteration of computing hardware, software, or data

Connector symbol--Connects separated portions of a flowchart without drawing lines between the parts

Control unit--Oversees the processing activities of the entire computer system; executes instructions from programs, monitors the movement of data in storage, allocates storage positions, and coordinates input/output activities

Correspondence center--The room or area housing equipment and personnel for the production of typed documents

Cylinder--A group of tracks that have the same number comprising one track of each of the recording surfaces of a magnetic disk pack

Data--A collection of numbers and/or words to be processed

Data bank--A comprehensive collection of libraries of data

Data base--A data processing system consisting of a group of totally integrated and interactive files to store large quantities of related data

Data cell--A mass storage device capable of storing data on strips of magnetic tape

Data format--The form in which data is to appear in a computer printout

Data transfer rate--The speed at which data is transferred between the CPU and its secondary storage devices

Debugging--Task of detecting, locating, and eliminating mistakes in a program

Deck checking--Visually inspecting a program and tracing its logic to eliminate errors before submitting the program to the computer

Decision symbol--Indicates that a decision must be made at this point

Density--The number of bytes of data that are recorded on one inch of magnetic tape or in one sector of a floppy disk

Diagnostics--Computer-generated error messages that identify mistakes in coding

Direct access--Feature of magnetic media which makes it possible to find information instantly on the medium without regard to the sequence

Direct access storage--File storage where any record can be accessed without the need to access all preceding records

Display symbol--Represents information displayed by on-line printer keyboards or visual-display units

Documentation--The illustrations and explanations that should accompany the computer printout of a "working" program that include both general information needed by the user of the program and the specific information needed by the computer operator or by the computer programmer if the program later needs updating

Document symbol--Represents paper documents and reports of all varieties

Electronic mail--Communications sent electronically over telephone or telegraph lines or relayed by a staellite network

ENTREE card--Plastic card which is used instead of writing checks; money is automatically deducted from a customer's account and credited to the proper merchant

Erasable Programmable Read Only Momory (EPROM)--One of the most current types of monolithic memories that can be programmed by the user and erased and reprogrammed with different information

Expiration date--The part of a header label that indicates the latest possible date a file can be used in processing

Extended Binary Coded Decimal Interchange Code (EBCDIC)--An 8-bit code for character representation

Facsimile--The process of transmitting textual and illustrative copy electronically

Fiber optics--Technology based upon lightweight, smooth hair-like strands of transparent material used for transmission of data and sound at high rates of speed

Floppy disk--An oxide-coated plastic disk enclosed in a protective covering that can be used for the storage of data

Flowcharting template--Plastic or metallic card containing both system and program flowcharting symbols as cutout forms

Flowlines--Indicate the direction of processing of flow of data

Flow direction--Indicates that part of logical flow in a program

FORTRAN--A high-level programming language designed for scientists, mathematicians, and engineers

Hard copy--Printed output from an information system

Hardware--The physical equipment in a computer system

Hexadecimal number system--A numeration system using the symbols 0 through 9 and A, B, C, D, E, and F and having a base of 16

High-level programming languages--A class of programming languages which are generally machine-independent, i.e., do not necessitate a high degree of knowledge of the machine compiler or generator language

Hollerith code--A code widely used for representing data on an 80-column punched card

Holographic storage--An advanced data storage technique involving the use of lasers to store data images on plastic plates

Housekeeping--Operations of a program or system that do not contribute directly to the solution of a problem but are necessary processing functions, such as checking labels

Impact printer--Physically strikes paper surface leaving character images on paper similar to a typewriter

Information processing--Manipulation of factual matter of all kinds for the purpose of producing a desired answer or result

Input--Means by which data from keyboards, punched cards, punched paper tape, along with magnetic ink characters, printed characters, and other magnetic devices are entered into an information processing system

Input medium--Device for reading in data to be processed by the computer

Input/output devices--Device mechanisms for reading data to be processed and for reporting results

Input/output symbol--Represents an input or output operation

Installation--A particular word processing or data processing computing system in terms of the work it does and the people who manage, operate, service, apply it to problems, and use the results it produces

Interblock gap (IBG)--A blank space between blocks of data on magnetic tape, which enables the tape to accelerate to the proper reading speed and decelerate from that speed

Interpreter--A program that reads source statements and immediately causes the statements to be executed one at a time

K--symbol denoting 1024 units of storage

Load-point marker--A reflective strip at the beginning of a reel of tape indicating the physical point that data can be recorded

Logical errors--Errors which occur when the programmer does not thoroughly understand a phase of the problem, fails to account for all situations that may arise during processing, or misinterprets some steps when coding

Logical operation--An operation performed to compare the relationship between numeric and nonnumeric data and make a logical decision

Logging--A method of recording incoming and outgoing work to assist in monitoring and controlling its flow

Low-level programming language--Programming language which is closely related to a particular machine

Machine language--A programming language that can be interpreted directly by the internal circuitry of the computer

Machine shorthand--A machine which enables one keystroke or a combination of keystrokes to represent dictation

Magnetic bubble memory--An advanced data storage technique in which microscopic magnetized bubbles, representing data, are stored on the surface of a magnetic film

Magnetic core--A tiny doughnut-shaped element about the size of a grain of salt, which is capable of being magnetized in a clockwise or counterclockwise direction

Magnetic drum--A rotating cylinder made with a special surface so that data can be stored on it in the form of magnetized spots

Magnetic disk--Thin metal disk coated on each side so that data can be recorded in the form of magnetized spots

Magnetic floppy disk--A flexible disk (diskette) of oxide-coated mylar

Magnetic media--Equipment that uses media such as magnetic cards, cassettes, disks, and belts in text editors, dictation, and data processing equipment to record and store information

Magnetic tape--Medium on which data is recorded in the form of magnetized spots on the surface of magnetically sensitive coated tape

Magnetic tape cartridge medium--A container holding magnetic tape that can be processed without separating it from the container

Magnetic tape symbol--Represents magnetic tape file

Main memory--The main storage area of the CPU that holds the program and data being processed

Memory--The main storage area of the computer which holds all programs and data being processed

Megabyte--1,000,000 units of storage

Microprocessor--A computer system commonly consisting of a CRT, keyboard, and limited storage, costing less than $10,000.00

Modem--A device that converts data into impulses and transmits them over telephone lines from the terminal to the computer and vice versa

Network--The physical equipment used to connect one location to another for the purpose of transmitting and receiving information

Non-impact printer--Forms characters by transferring electrical charges to the paper

Non-volatile memory--System where contents are not lost when the power is removed

Object program--Source program converted to machine language

Octal number system--A numeration system using the digits 0, 1, 2, 3, 4, 5, 6, and 7 and having a base of 8

Off-line processing--Where data is recorded on a machine-readable medium instead of being transmitted directly to or from the computer

On-line--In direct communication with the computer

On-line batch processing--A system in which data is accumulated in batches and transmitted directly to the computer for processing

On-line processing--Where data is transmitted directly to or from the CPU

Output--Means by which information is reported from computer storage in a form that can be understood by human beings or in a form suitable for use as input for another computer system

Paper tape--A continuous paper tape recording medium, containing rows of punched holes that represent a code for letters, digits, and symbols

Photodigital storage--Associated with optical memory storage, in which lasers record data on chips of film

PL/1--A high-level programming language developed by IBM for use as a general purpose language in both business and scientific applications

Point-of-sale automation--A system in which retail goods are labeled with machine-readable symbols (using the Universal Price Code) and in which cashier checkout stations are equipped with devices for reading these labels

Principals (word originators)--Individuals within an organization who originate paperwork and require secretarial support

Privacy Act of 1974--A law enacted in 1974 to protect rights of citizens from invasion of privacy

Procedural manual--A booklet containing step-by-step instructions with appropriate illustrations on how to perform a task

Processing symbol--Indicates a change in the form or value of data will occur, or that an operation or process is to be performed

Program–A complete set of instructions that directs the computer and coordinates the operation of the various computer components

Program flowchart--A detailed pictorial representation of the steps necessary to solve a problem

Programmable Read Only Memory (PROM)--Storage area in microcomputers and minicomputers that contains monitors, input/output devices, and special application programs

Programming languages--Languages used in writing programs to direct processing steps carried out by a computer

Punch card deck symbol--Represents punched card file

Punched card--A storage medium in which data is represented by means of holes punched in vertical columns in a paper card

Random Access Memory (RAM)--Main storage areas used with microcomputers, minicomputers, and text-editing equipment into which data can be written or read

Read Only Memory (ROM)--Storage areas used with microcomputers, minicomputers, and text-editing equipment that permit data to be read from them because they are permanently wired to perform one function or contain specific data

Read/write head--Small electromagnetic component used for reading, writing, or erasing the polarized spots that represent data on magnetic media

Real time--An on-line processing system in which data is processed the instant it occurs

Remote job entry (RJE)--A device which permits the telecommunication of data to and from a distant computer that can support the input of cards, the output of printed reports, and the use of terminals to input or output data

Rotational delay--The time necessary for the magnetic disk to spin and place the desired data beneath the proper read/write head

Rough draft--A handwritten or typed copy that is to be revised or corrected or a copy that already has revisions marked on it

RPG--A high-level programming language designed to provide an easy method of generating routine business reports

Secondary storage--A supplementary means for storing large quantities of data and programs; separate from but directly attached to the CPU and stores data in a format that is compatible with data held in primary storage

Sector--A portion of a track from a magnetic disk on which data is stored

Semiconductor--Storage that consists of many wired silicon chips with on-off switches that direct the current that is passing through the storage locations

Sequential storage medium--Medium which reads and/or writes information in order, one record at a time

Shared logic--A type of text-editing system in which several keyboard terminals simultaneously use the memory and processing powers of a single CPU

Silicon chips--Miniature integrated circuits which have replaced transistors

Soft copy--Output displayed on a terminal screen

Source language--Language used in COBAL, PL/1, BASIC, for example

Source program--Initial program fed into the computer

Storage--The retention of data so that the data can be obtained at a later time

System flowchart--A series of symbols designed to show the data flow and operational sequence of a system

System library--A collection of software designed to aid the user and/or user program

Tape marks--A special code character placed at the end of each data file stored on tape

Telecommunications--Transmission of information over long distance by telegraph, radio, or other electromagnetic means

Teleprocessing--The telecommunication and processing of data via terminals possessing a visual display capability

Teleprocessing system (data communication system)--A system in which data is collected at one or more points of origin, transmitted to a central location, and processed to produce results that are distributed to one or more points of use

Terminal--A video display used for sending and receiving data

Terminal symbol--Represents the beginning, end, or point of interruption in a program

Testing--Running of a program or system of programs against representative data to insure the adequacy of the program or system for regular use

Text-editing equipment--An electric typewriter that has the ability to store typewritten materials and designed primarily for heavy revision work

Time-sharing--That which permits many users to simultaneously have access to the same computer system

Tracks--One of several concentric circular rings in which information is stored on a magnetic disk

Transcribe--To convert recorded data into a typed document or other form of hard copy

Transistors--A small solid-state semiconductor, used as a basic building block in the circuitry of second-generation computers

User--The recipient of computer services

Vacuum tube--A sealed tube or bulb from which almost all the air has been removed

Voice processing--The recognition and response to the spoken word

Word--A storage unit that can hold one or more bytes

Work measurement--A process of determining how much time is required to do a given amount of work

Word processing system--The combination of specific procedures, methods, equipment, and people designed to accomplish the transition of a written, verbal, or recorded word distributed to its ultimate use

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(NOTE: This is an alphabetized list of references used in completing this text.)

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Wanous, S.J., Gerald Wagner, and Stephen F. Hallman. *Introduction to Automated Data Processing.* Second Edition. Dallas: South-Western Publishing Co., 1979.

ADDITIONAL MATERIALS

(NOTE: The following journals, magazines, newspapers, and audiovisual materials may be helpful by suppling additional trade information.)

Apple Orchard. P.O. Box 1493, Beaverton, OR 97075.

BYTE. P.O. Box 590, Martinville, NJ 08836.

Computer Career News. Available from the Computer Career News Publishing Co., Box 1005, Oradell, NJ 07649.

Creative Computing. P.O. Box 789-M, Morristown, NJ 07960.

Indiana University Audio-Visual Center. Indiana University, Bloomington, IN 47405.

NIBBLE. P.O. Box 325, Lincoln, MA 01773.

T.H.E. Journal. P.O. Box 992, Acton, MA 01720.

Word Processing. An audiovisual production of the Robert J. Brady Co. Bowie, MD 20715: Prentice-Hall Company.

xxx

INTRODUCTION TO INFORMATION PROCESSING
UNIT I

UNIT OBJECTIVE

After completion of this unit, the student should be able to match types of information processing hardware with their characteristics, and select the primary needs for information processing within many businesses and government agencies. The student should also be able to complete an attitude test, conduct a business interview, and unscramble information processing words. This knowledge will be evidenced by correctly performing the procedures outlined in the assignment sheets and by scoring 85 percent on the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms associated with the introduction to information processing with the correct definitions.
2. Match types of information processing hardware with their characteristics.
3. Select the primary needs for information processing within many businesses and government agencies.
4. List information processing applications in various industries.
5. Select true statements concerning ethics and the confidentiality of information.
6. Complete an attitude test concerning ethics in the information processing field.
7. Conduct a business interview.
8. Unscramble information processing words.

INTRODUCTION TO INFORMATION PROCESSING
UNIT I

SUGGESTED ACTIVITIES

I. Provide student with objective sheet.

II. Provide student with information and assignment sheets.

III. Discuss unit and specific objectives.

IV. Discuss information and assignment sheets.

V. Have students interview three people of different professions in their community and present a report of their views of the computer today and the computer of the future. Encourage students to discuss the computer's importance in relation to the areas of word and data processing.

VI. Have students prepare a slide presentation of an information processing installation.

VII. Invite a data processing or word processing manager to speak to the class concerning the need for information processing within his/her business.

VIII. Form a related student organization, e.g., D.P.M.A., I.W.P., FBLA-PBL, OEA.

IX. Have students locate articles on computer crimes and report on these crimes to class.

X. Give test.

INSTRUCTIONAL MATERIALS

I. Included in this unit:

- A. Objective sheet
- B. Information sheet
- C. Assignment sheets
    1. Assignment Sheet #1--Complete an Attitude Test Concerning Ethics in the Information Processing Field
    2. Assignment Sheet #2--Conduct a Business Interview
    3. Assignment Sheet #3--Unscramble Information Processing Words

D. Answers to assignment sheets

E. Test

F. Answers to test

II. References:

A. Bohl, Marilyn. *Information Processing.* Chicago: Science Research Associates, Inc., 1980.

B. Spencer, Donald D. *Data Processing: An Introduction.* Columbus, OH: Charles E. Merrill Publishing Company, 1978.

C. Malstrom, Robert C. *SRA Data Processing Glossary*. Chicago: Science Research Associates, Inc. 1979.

D. Shelly, Gary B. and Thomas J. Cashman. *Introduction to Computers and Data Processing.* Fullerton, CA: Anaheim Publishing Company, 1980.

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INTRODUCTION TO INFORMATION PROCESSING
UNIT I

INFORMATION SHEET

I. Terms and definitions

A. Information processing--Manipulation of factual matter of all kinds for the purpose of producing a desired answer or result

(NOTE: This definition includes both data processing and word processing.)

B. Program--A complete set of instructions that directs the computer and coordinates the operation of the various computer components

(NOTE: This term is also known as software.)

C. Hardware--The physical equipment in a system

D. Input--Entering data into the information processing system

E. Output--Means by which information is reported from storage in a form that can be understood by human beings or in a form suitable for use as input for another system

(NOTE: Input/output is a term used to refer to device mechanisms for reading data to be processed and for reporting results.)

F. Storage--The retention of data so that the data can be obtained at a later time

G. CRT (cathode ray tube)--A vacuum tube with a screen and a controlled beam of electrons that may be used either as a display or a storage device or both

(NOTE: This is also referred to as a video display terminal.)

H. Auxiliary storage device--A supplementary means for storing data

(NOTE: This is also referred to as secondary storage.)

I. Cassette tape cartridge--Two reels of magnetic tape enclosed in a small plastic or metal cartridge

J. Magnetic floppy disk--A flexible disk (diskette) of oxide-coated mylar

(NOTE: These are stored in paper or plastic envelopes.)

K. CPU (central processing unit)--The major component of a computer system which is responsible for processing all data handled by the system

L. Byte--A storage unit of primary storage that normally represents and stores exactly one character of data and is normally composed of eight bits

INFORMATION SHEET

M. K--Symbol denoting 1024 bytes of storage

N. Data--A collection of numbers and/or words to be processed

(NOTE: Time card data is used to provide payroll data.)

O. Megabyte--1,000,000 units of storage

P. Terminal--Input/output device consisting of a typewriter keyboard, and often a CRT, enabling its user to have direct contact with the system

Q. Batch processing--The accumulation and processing of data as a group

R. Data base--A comprehensive data file containing information in a format applicable to a user's needs; available when needed

S. Data bank--A comprehensive collection of libraries of data

T. Text-editing equipment--An electric typewriter that has the ability to store typewritten materials; designed primarily for heavy revision work

U. Time-sharing--That which permits many users to simultaneously have access to the same system

V. Computer crime--The use of data processing equipment for fraud and extortion, and the malicious use or alteration of system hardware, software, or data

W. Shared-logic--A type of text-editing system in which several keyboard terminals simultaneously use the memory and processing powers of a single CPU

X. Privacy Act of 1974--A law enacted in 1974 to protect rights of citizens from invasion of privacy

II. Types of information processing hardware and their characteristics

A. Electronic calculator

1. Small and portable
2. Has pre-wired functions
3. Range from inexpensive to expensive
4. Some models can accept stored programs

(NOTE: Some desk models have low-speed printers for printing out computation results.)

INFORMATION SHEET

B. Computers

1. Microcomputer

   a. Most have CRT (cathode ray tube) as a primary output device (Figure 1)

   b. Typewriter-like keyboard is primary means of input

   c. Most have an auxiliary storage device which utilizes a cassette tape cartridge or magnetic floppy disk

   d. Central processing unit (CPU)--Memory sizes range from 4K to 64K

   Examples: Radio Shack TRS-80, Apple, Wang, Commodore PET

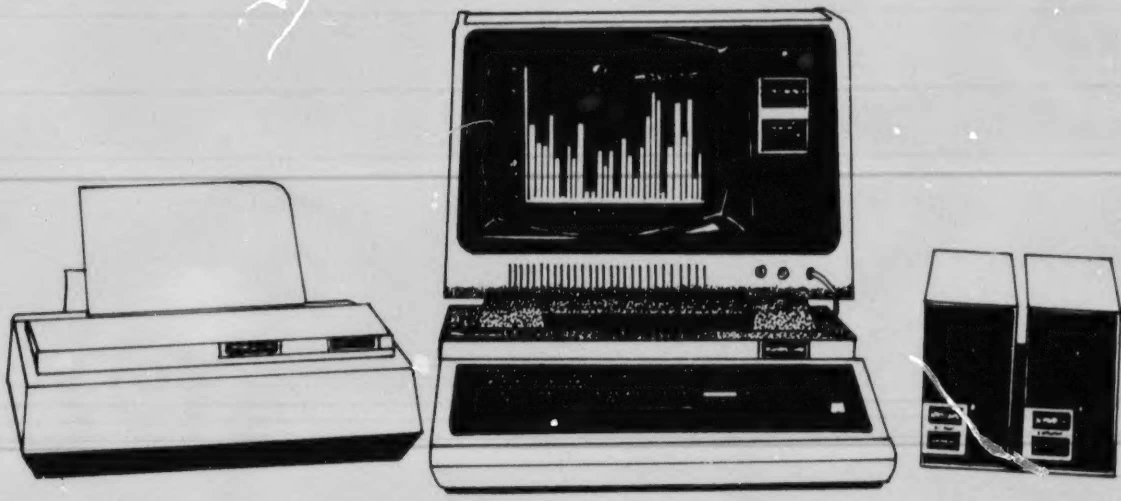


Figure 1
Microcomputer

INFORMATION SHEET

2. Minicomputer
   a. CPU--Memory size range of 4K to 256K (Figure 2)
   b. Classes of minicomputers:
      (1) Mini--4K to 16K
      (2) Midi--16K to 64K
      (3) Maxi--64K to 256K
   c. Can utilize tape cassettes, floppy disks, or magnetic disks

      (NOTE: An accounting computer is basically a minicomputer whose input and output devices have been specialized for accounting applications.)

      Examples: IBM 34, IBM 32, PDP II

Figure 2
Minicomputer

INFORMATION SHEET

3. Medium scale computers

   a. CPU--Memory size range of 64K to 512K (Figure 3)

   b. Peripheral devices

      (1) Card reader--A device that reads, or senses holes in cards, transforming them from patterns of holes to patterns of electrical pulses

      (2) Card punch--An output device which makes holes in cards in certain patterns so as to represent data

      (3) Tape drive--An input/output device used to read and write data in the form of magnetic spots on reels of tape coated with a magnetizable material

      (4) Disk drives--An input/output device used to read and write data on thin magnetic disks whose surfaces have been coated with a magnetizable material

      (5) High-speed printer--An output device which prints 300 to 3,000 lines per minute; also called a line printer

      (6) Low-speed printer--An output device which prints a character at a time similar to the typewriter; prints from 15 characters per second up to 300 lines per minute

      (NOTE: The low-speed printer is primarily used by colleges, and government and military installation plants.)

      Examples: IBM System 370
      Univac 1100/10
      Burroughs 4700
      Honeywell 62/60

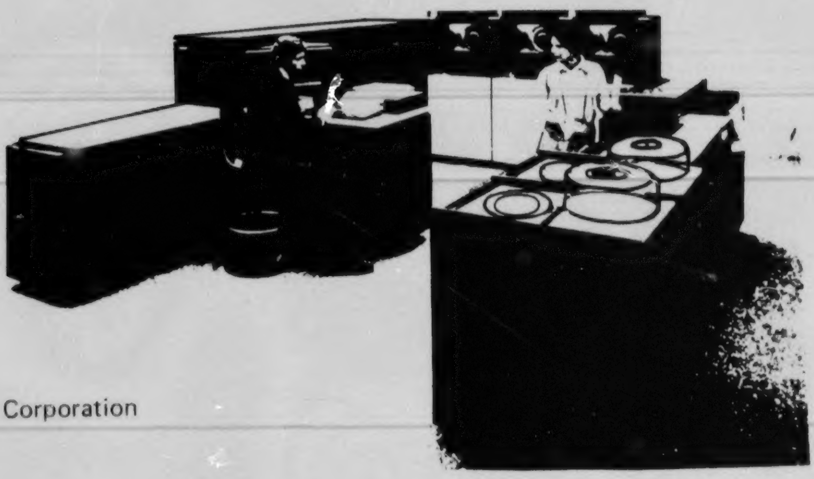


Figure 3
Medium
Scale Computer

Courtesy Honeywell Corporation

INFORMATION SHEET

4. Large scale computers

   a. CPU--Memory size range of 512K to under 5 megabytes (Figure 4)

   b. Peripheral devices

      (1) Tape drive--An input/output device used to read and write data in the form of magnetic spots on reels of tape coated with a magnetizable material

      (2) Disk drive--An input/output device used to read and write data on thin magnetic disks whose surfaces have been coated with a magnetizable material

      (3) Plotter--A printing device capable of providing continuous line drawings and pictorial solutions to data processing problems; offers a picture not possible with conventional line printers

      (4) OCR (Optical Character Reader)--Input device that reads characters by comparing their features with those of similar characters stored in memory

      (5) MICR (Magnetic Ink Character Reader)--Device that reads and processes information that is printed or typed in magnetic ink in specially designed numbers and symbols

      (6) RJE (Remote Job Entry)--Entering jobs into a batch processing system at a location remote from the central computer site

      (NOTE: Primarily used for batch processing, telecommunications, and to support databases.)

      Examples: IBM 4300, Burroughs 6700, Honeywell 66/80

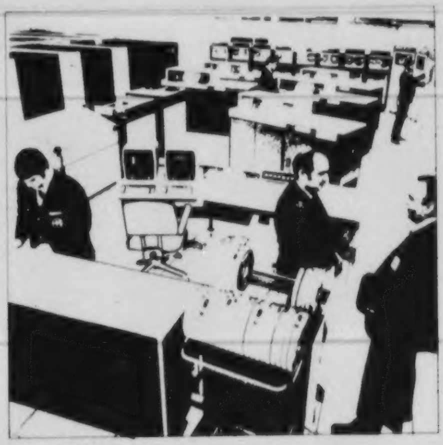


Figure 4
Large Scale Computer

Courtesy Burroughs

INFORMATION SHEET

5. Super computers

   a. CPU--Memory size range in excess of 5 million bytes (Figure 5)

   b. Operates at speeds 2 to 5 times that of large scale systems

   c. Used by vast corporations or government agencies

      (1) NASA

      (2) Defense facilities

      (3) U.S. Weather Service

      (4) Airline reservation systems

      Examples: CDC Cyber 700, Cray -1

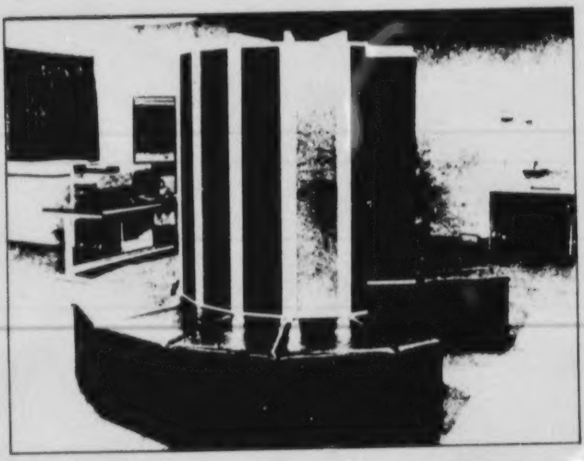


Figure 5
Super Computer

Courtesy Cray Research

6. Text-editing equipment

   a. Stand-alone text-editing equipment (Figure 6)

      (1) Equipment not hooked into a separate computer

      (2) Temporary storage in internal memory

      (3) May have permanent storage on auxiliary storage

      (4) May have a single CRT

(5) Designed for revision of typewritten materials

Examples: A.B. Dick Magna III
Zerox 860
IBM System 6

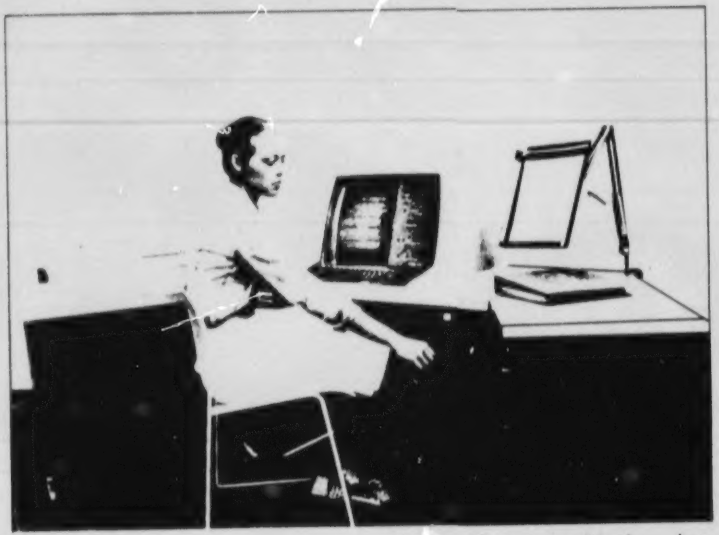


Figure 6
Text-Editor

Courtesy Vydec, Inc.

b. Shared-logic text-editing systems

(NOTE: Computers can have text-editing software programs.)

(1) Controlled by one central processing unit

(2) Has several CRTs

(3) Auxiliary storage devices

(4) May use a computer that is capable of supporting peripheral devices such as optical character recognition readers and high-speed printers

Examples: IBM System 6
Wang

III. Primary needs for information processing within many businesses and government agencies

A. To operate a business

Example: Data about customer's orders must be processed so that the shipping department can fill the orders and the billing department can prepare the correct bill

INFORMATION SHEET

B. To control a business--In order to make future plans, managers need specific information concerning performance and results

C. To satisfy outside needs for data

Examples: U.S. Treasury Department, Equal Employment Opportunity Commission

IV. Information processing applications in various industries

A. Manufacturing

1. Design of products
2. Production of tools needed
3. Control of processes
4. Inventory control

B. Transportation

1. Scheduling
2. Time tables
3. Inventory

C. Retail sales

1. Inventory control
2. Verify credit card purchases

D. Education

1. Computer aided instruction (CAI)
2. Simulations
3. Programming languages

E. Law enforcement

1. Analyze unidentified substances
2. Fingerprints
3. License numbers
4. Information on wanted and missing persons and stolen articles

INFORMATION SHEET

F. Finance
  1. Deposits and withdrawals
  2. Check processing
  3. Customer account updating
  4. Loan processing
  5. Self-service automatic teller terminals
  6. Electronic funds transfer systems
  7. Direct deposits
  8. Automatic bill payment

G. Medicine
  1. Diagnosis
  2. Simulations
  3. Accounting
  4. Patient records

H. Home
  1. Control home heating and air conditioning
  2. Automatic watering of lawns and gardens
  3. Operate security systems
  4. Allow personal computation of household budgets, taxes, investments, savings and checking accounts

I. Entertainment
  1. Aid in writing orchestrations
  2. Aid in the production of feature films and animated movies
  3. Designing sculpture
  4. Making television commercials and programs
  5. Games

INFORMATION SHEET

J. Legal

1. Revision of legal documents
2. Aid in court recording

V. Ethics and confidentiality of information

A. Ethics and computer crime

1. The possibilities that exist for theft in electronic data processing systems are limited only by the imaginations of all who directly or indirectly come in contact with the system
2. Paper media, magnetic media, terminals, and even complete computer systems may be taken from their assigned locations
3. A computer-generated parts list or a confidential or internal-use-only produced development plan may be pirated by a disgruntled employee
4. Computer files containing owned data or programs can be copied, and the copies sold to a competitor, yet the original files remain in place and if the competitor uses the files discreetly, no one may be the wiser
5. An employee may use computer time and storage media for non-company purposes or an employee may create fictitious vendor accounts and submit input causing payments to be made to those accounts
6. It is possible to use computers to steal without ever having access to or even seeing that which is stolen

B. Confidentiality of information

1. It is technically and economically feasible to store large volumes of data in such a way that this data can be readily accessed and analyzed
2. Data banks have been established on individuals, companies, and government agencies
3. A data bank file may contain a great deal of both personal and professional information about an individual, with some information pertinent and some not
4. Because data bank information is easy to maintain and is instantly available, spying and invasion of privacy has developed
5. Because of the problems with spying and invasion of privacy, the Privacy Act of 1974 was passed to regulate the flow of personal information to and from federal government agencies

INTRODUCTION TO INFORMATION PROCESSING
UNIT I

ASSIGNMENT SHEET #1--COMPLETE AN ATTITUDE TEST CONCERNING ETHICS IN THE INFORMATION PROCESSING FIELD

Directions: Place an "E" for ethical, "U" for unethical, or a "C" for computer crime in the space provided which best reflects your opinion.

(NOTE: This assignment should be used for discussion purposes only.)

_____1. A copy of a company's accounts payroll program which was developed by a programmer on the job was given to a programmer from a different company.

2. A student, not enrolled in a computer course, obtained a friend's password to obtain access to the school's computer. A laboratory fee is charged the students enrolled in computer programming courses. The unauthorized student used four hours of computer time.

_____Student enrolled in class

_____Unauthorized student

_____3. Fifteen minutes of computer time was used by a computer operator to run a friend's program during a period of time when the computer was idle, i.e., when the computer was not being used for the company's business.

_____4. Money was electronically transferred from an inactive account to a bank teller's account. After pay day, the bank teller transferred the money back to the customer's account. No interest was lost and no money changed hands.

_____5. An employee was able to break a security code and reviewed confidential information about the company executives. When the employee was caught, it was found that no use was made of the information.

6. A programmer was asked to write a program which would generate inaccurate information for stockholders of the company. When the programmer questioned the manager, the programmer was told to write it or lose the job. The programmer decided to write the program.

_____Company

_____Programmer

INTRODUCTION TO INFORMATION PROCESSING
UNIT I

ASSIGNMENT SHEET #2--CONDUCT A BUSINESS INTERVIEW

Directions: Visit a business or company which uses information processing equipment and interview an employee who works with the equipment. Use the following questions in conducting the interview and be prepared to present your findings in class.

1. Do you work more closely with the processing of words or data, or do you work with both?

2. What are your main responsibilities?

3. What is your career title?

4. What do you consider the most important aspects in training for your position?

5. What personal attributes and skills would a person need for your job?

6. What changes do you foresee for the future (related to your job)?

ASSIGNMENT SHEET #2

7. Do you like your job? Why?

8. What types of equipment do you use?

INTRODUCTION TO INFORMATION PROCESSING
UNIT I

ASSIGNMENT SHEET #3--UNSCRAMBLE INFORMATION PROCESSING WORDS

Directions: Unscramble the letters below to find ten words related to information processing.

(NOTE: There may be two words on one line.)

1. TPUUOT
2. RPNOOCITEAMSSGNRINFOI
3. SEUMCOPTR
4. MMYROE
5. PCU
6. RNEPIRT
7. PPKIYLSSDOF
8. AEDHAWRR
9. EGRASTO
10. GPORMAR

INTRODUCTION TO INFORMATION PROCESSING
UNIT I

ANSWERS TO ASSIGNMENT SHEETS

Assignment Sheet #1

(NOTE: These answers are suggested for discussion purposes only.)

1. U or C
2. Student enrolled in class: U
   Unauthorized student: U
3. U
4. C
5. U
6. Company: C
   Programmer: U

Assignment Sheet #2--Evaluated to the satisfaction of the instructor

Assignment Sheet #3

1. Output
2. Information processing
3. Computers
4. Memory
5. CPU
6. Printer
7. Floppy disks
8. Hardware
9. Storage
10. Program

INTRODUCTION TO INFORMATION PROCESSING
UNIT I

NAME ______________________

TEST

1. Match the terms on the right with the correct definitions.

(NOTE: The terms on this page should be matched to the definitions on this page; the same procedure applies on the next page.)

______ a. A law enacted in 1974 to protect rights of citizens from invasion of privacy

______ b. A supplementary means for storing data

______ c. Means by which information is reported from storage in a form that can be understood by human beings or in a form suitable for use as input for another system

______ d. A comprehensive data file containing information in a format applicable to a user's needs; available when needed

______ e. A vacuum tube with a screen and a controlled beam of electrons that may be used either as a display or a storage device or both

______ f. The retention of data so that the data can be obtained at a later time

______ g. The accumulation and processing of data as a group

______ h. Two reels of magnetic tape enclosed in a small plastic or metal cartridge

______ i. The physical equipment in a system

______ j. The major component of a computer system which is responsible for processing all data handled by the system

______ k. A flexible disk of oxide-coated mylar

1. Hardware
2. Auxiliary storage device
3. Batch processing
4. Cassette tape cartridge
5. CPU
6. CRT
7. Privacy Act of 1974
8. Storage
9. Data base
10. Output
11. Magnetic floppy disk

_____l. Symbol denoting 1024 bytes of storage

_____m. A comprehensive collection of libraries of data

_____n. Entering data into the information processing system

_____o. An electric typewriter that has the ability to store typewritten materials; designed primarily for heavy revision work

_____p. Manipulation of factual matter of all kinds for the purpose of producing a desired answer or result

_____q. A storage unit of primary storage that normally represents and stores exactly one character of data and is normally composed of eight bits

_____r. A complete set of instructions that directs the computer and coordinates the operation of the various computer components

_____s. A type of text-editing system in which several keyboard terminals simultaneously use the memory and processing powers of a single CPU

_____t. A collection of numbers and/or words to be processed

_____u. 1,000,000 units of storage

_____v. Input/output device consisting of a typewriter keyboard, and often a CRT, enabling its user to have direct contact with the system

_____w. That which permits many users to simultaneously have access to the same system

_____x. The use of data processing equipment for fraud and extortion, and the malicious use or alteration of system hardware, software, or data

12. K
13. Input
14. Data bank
15. Program
16. RPG
17. Information processing
18. Text-editing equipment
19. Shared-logic
20. Byte
21. Data
22. Time-sharing
23. Megabyte
24. Computer crime
25. Terminal

2. Match the types of information processing hardware on the right with their characteristics.

______a. Small and portable; ranges from inexpensive to expensive; has pre-wired functions; some models can accept stored programs

______b. Most have CRT as primary output device; typewriter-like keyboard is primary means of input; most have an auxiliary storage device which utilizes a cassette tape cartridge or magnetic floppy disk; CPU memory sizes range from 4K to 64K

______c. Three classes include mini, midi, and maxi; CPU memory size range of 4K to 256K; can utilize tape cassettes, floppy disks, or magnetic disks

______d. Peripheral devices include card reader, card punch, tape drives, disk drives, high speed printers, and low speed printers; CPU memory size ranges of 64K to 512K

______e. CPU memory size range of 512K to under 5 megabytes; peripheral devices include tape drive, disk drive, plotter, OCR, MICR, and RJE

______f. CPU memory size range in excess of 5 million bytes; used by vast corporations and government agencies; operates at speeds 2 to 5 times that of large scale systems

______g. Designed for revision of typewritten materials; equipment not hooked into a separate computer; temporary storage in internal memory; may have permanent storage on auxiliary storage; may have a single CRT

______h. Word processing unit controlled by one central processing unit; has several CRTs and auxiliary storage devices; may use a computer that is capable of supporting peripheral devices such as optical character recognition readers and high-speed printers

1. Large scale computers
2. Super computers
3. Electronic calculator
4. Shared-logic text-editing systems
5. Microcomputers
6. Medium scale computers
7. Stand-alone text-editing equipment
8. Minicomputers

3. Select the primary needs for information processing within many businesses and government agencies by placing an "X" in the appropriate blanks.

   _____a. To operate a business

   _____b. To control a business

   _____c. To market products within a given test market

   _____d. To satisfy outside needs for data

   _____e. To identify potential managerial talent

4. List one example of an information processing application in each of the following industries.

   a. Manufacturing ____________________

   b. Transportation ____________________

   c. Retail sales ____________________

   d. Education ____________________

   e. Law enforcement ____________________

   f. Finance ____________________

   g. Medicine ____________________

   h. Home ____________________

   i. Entertainment ____________________

   j. Legal ____________________

5. Select true statements concerning ethics and the confidentiality of information by placing an "X" in the appropriate blanks.

   _____a. It is impossible for a theft of any kind to occur in an electronic data processing system environment

   _____b. A computer-generated parts list or a confidential or internal-use-only produced development plan may be pirated by a disgruntled employee

   _____c. Computer files containing owned data or programs can be copied, and the copies sold to a competitor, yet the original files remain in place and if the competitor uses the files discreetly, no one may be the wiser

   _____d. An employee would never have access to a computer long enough to do any real damage to accounts in the computer _____e. It is possible using computers to steal without ever having access to or even seeing that which is stolen

_____f. It is technically and economically feasible to store large volumes of data in such a way that this data can be readily accessed and analyzed

_____g. Data banks have not been established on individuals

_____h. Because data bank information is easy to maintain and is instantly available, spying and invasion of privacy has developed

_____i. Because of the problems with spying and invasion of privacy, the Privacy Act of 1974 was passed to regulate the flow of personal information to and from federal government agencies

6. Complete an attitude test concerning ethics in the information processing field.

7. Conduct a business interview.

8. Unscramble information processing words.

(NOTE: If these activities have not been accomplished prior to the test, ask your instructor when they should be completed.)

    5. Self-service automatic teller terminals
    6. Electronic funds transfer systems
    7. Direct deposits
    8. Automatic bill payment

  G. Medicine
    1. Diagnosis
    2. Simulations
    3. Accounting
    4. Patient records

  H. Home
    1. Control home heating and air conditioning
    2. Automatic watering of lawns and gardens
    3. Operate security systems
    4. Allow personal computation of household budgets, taxes, investments, savings and checking accounts

  I. Entertainment
    1. Aid in writing orchestrations
    2. Aid in the production of feature films and animated movies
    3. Designing sculpture
    4. Making television commercials and programs
    5. Games

  J. Legal
    1. Revision of legal documents
    2. Aid in court recording

5. b, c, e, f, h, i

6. Evaluated to the satisfaction of the instructor

7. Evaluated to the satisfaction of the instructor

8. Evaluated to the satisfaction of the instructor

INTRODUCTION TO INFORMATION PROCESSING
UNIT I

ANSWERS TO TEST

1.

a.	7	i.	1	q.	20
b.	2	j.	5	r.	15
c.	10	k.	11	s.	19
d.	9	l.	12	t.	21
e.	6	m.	14	u.	23
f.	8	n.	13	v.	25
g.	3	o.	18	w.	22
h.	4	p.	17	x.	24

2.

a.	3	e.	1
b.	5	f.	2
c.	8	g.	7
d.	6	h.	4

3. a, b, d

4. Any one application in each of the following areas is acceptable:

   A. Manufacturing
      1. Design of products
      2. Production of tools needed
      3. Control of processes
      4. Inventory control

   B. Transportation
      1. Scheduling
      2. Time tables
      3. Inventory

   C. Retail sales
      1. Inventory control
      2. Verify credit card purchases

   D. Education
      1. Computer aided instruction
      2. Simulations
      3. Programming languages

   E. Law enforcement
      1. Analyze unidentified substances
      2. Fingerprints
      3. License numbers
      4. Information on wanted and missing persons and stolen articles

   F. Finance
      1. Deposits and withdrawals
      2. Check processing
      3. Customer account updating
      4. Loan processing

HISTORY
UNIT II

UNIT OBJECTIVE

After completion of this unit, the student should be able to match terms associated with the history of information processing with the correct definitions, and match names of inventors and inventions with achievements which were important to the development of information processing. The student should also be able to distinguish between the four generations of computers and complete a chart on the history of information processing. This knowledge will be evidenced by correctly performing the procedures outlined in the assignment sheet and by scoring 85 percent on the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms associated with the history of information processing with the correct definitions.
2. Match the names of inventors and inventions with achievements that were important to the development of information processing.
3. Distinguish between the characteristics of the four generations of computers.
4. Complete a chart on the history of information processing.

HISTORY
UNIT II

SUGGESTED ACTIVITIES

I. Provide student with objective sheet.

II. Provide student with information and assignment sheets.

III. Discuss unit and specific objectives.

IV. Discuss information and assignment sheets.

V. Show appropriate films or filmstrips.

VI. Bring a disk or computer chip to class to display to the students.

(NOTE: This activity is highly recommended.)

VII. Have vendors visit class and speak to the student organization.

VIII. Obtain an abacus and demonstrate in class.

IX. Give test.

INSTRUCTIONAL MATERIALS

I. Included in this unit:

  A. Objective sheet

  B. Information sheet

  C. Assignment Sheet #1--Complete a Chart on the History of Information Processing

  D. Answers to assignment sheet

  E. Test

  F. Answers to test

II. References:

  A. Wanous, S.J., Gerald Wagner, and Stephen F. Hallman. *Introduction to Automated Data Processing*. Second Edition. Dallas: South-Western Publishing Co., 1979.

  B. Couger, J. Daniel and Fred McFadden. *A First Course in Data Processing.* New York: John Wiley and Sons, 1977.

  C. Shelly, Gary B., and Thomas J. Cashman. *Introduction to Computers and Data Processing.* Fullerton, CA: Anaheim Publishing Company, 1980.

D. Bohl, Marilyn. *Information Processing.* Third Edition. Chicago: Science Research Associates, Inc., 1980.

E. Orilia, Lawrence. *Introduction to Business Data Processing.* New York: McGraw-Hill Book Company, 1979.

F. Spencer, Charles E. *Data Processing: An Introduction.* Columbus, OH: Merrill Publishing Company, 1978.

G. Casady, Mona. *Word Processing Concepts.* Dallas: South-Western Publishing Company, 1980.

H. South Carolina Department of Education. *Word Processing.* Columbia, SC: South Carolina Department of Education.

I. Bergerud, Marly, and Jean Gonzalez. *Word Processing Concepts and Careers.* New York: John Wiley and Sons, 1978.

J. Mason, Jennie. *Introduction to Word Processing.* New York: The Bobbs-Merrill Publishing Company, 1979.

HISTORY
UNIT II

INFORMATION SHEET

I. Terms and definitions

A. Punched cards--A storage medium in which data is represented by means of holes punched in vertical columns in a paper card

B. Control unit--Oversees the processing activities of the entire computer system

C. Arithmetic/logic unit--A major component of the computer that performs all arithmetic and logical operations under the direction of the control unit

D. Memory--The main storage area of the information processing system that holds all programs and data being processed

E. Input--Entering data into the computer

F. Output--Means by which information is reported from computer storage in a form that can be understood by human beings or in a form suitable for use as input for another computer system

G. Paper tape--A continuous paper tape recording medium, containing rows of punched holes that represent a code for letters, digits, and symbols

H. Vacuum tube--A sealed tube or bulb from which almost all the air has been removed

I. Word processing--The combination of people, procedures, and equipment that transforms ideas into printed communications and helps facilitate the flow of related office work

J. Magnetic tape cartridge medium--A container holding magnetic tape that can be processed without separating it from the container

(NOTE: This is also referred to as a magnetic tape cassette.)

K. Transistors--Small solid-state semiconductors, used as a basic building block in the circuitry of second-generation computers

L. Magnetic core--A tiny doughnut-shaped element about the size of a grain of salt, which is capable of being magnetized in a clockwise or counterclockwise direction

M. Semiconductor--Storage that consists of many wired silicon chips with on-off switches that direct the current that is passing through the storage locations

INFORMATION SHEET

N. Magnetic tape--Medium on which data is recorded in the form of magnetized spots on the surface of magnetically sensitive coated tape

O. Terminal--Input/output device consisting of a typewriter keyboard, and often a CRT, enabling its user to have direct contact with the system

II. Inventors, inventions, and achievements in information processing

A. Prior to 1900

1. Abacus

   a. One of the earliest known computation devices

   b. Developed in ancient Egypt and in the Orient

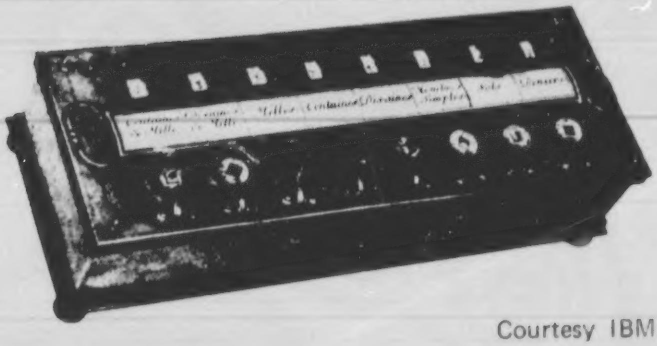
   c. Consisted of beads strung on wires to represent "place" such as units, tens, hundreds, thousands

2. Pascal

   a. Developed the first practical calculating machine in 1642 (Figure 1)

   b. Used gears to represent numbers 0 through 9

   c. Could perform only addition or subtraction



Courtesy IBM Corporation

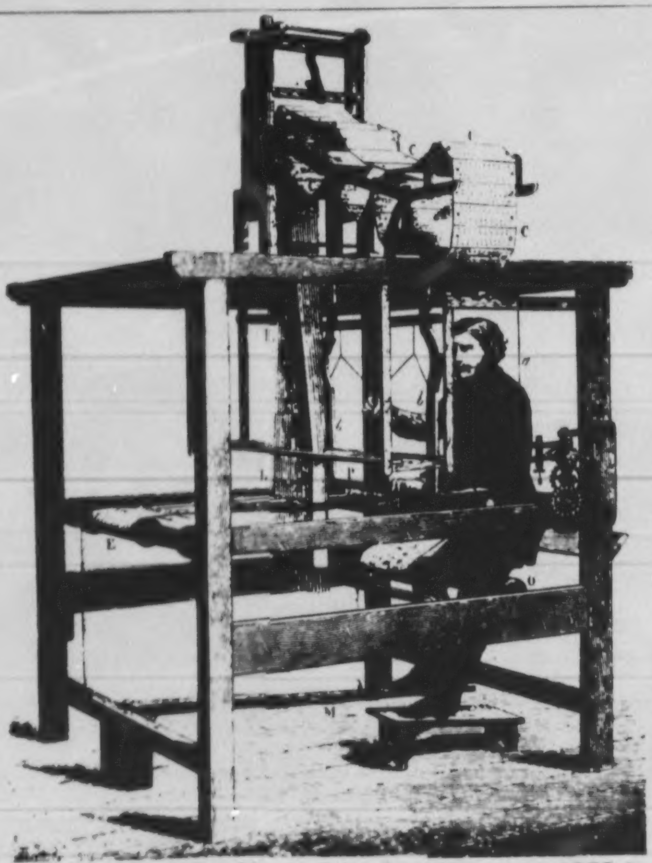
FIGURE 1 Pascal's Calculating Machine

INFORMATION SHEET

3. Leibnitz
    a. Developed the first calculator in the late 1600's
    b. Could add, subtract, multiply, and divide
    c. Included "stepped cylinders" as key elements in the calculator
    d. Very unreliable and awkward to use
4. Jacquard
    a. Developed the automated loom in 1804 (Figure 2)
    b. Used holes punched into a series of connected cards
    c. Controlled the weaving of fabrics
    d. Forerunner of Herman Hollerith's punched card

FIGURE 2

Joseph Jacquard and His Loom



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INFORMATION SHEET

5. Charles Babbage

   a. Developed the Difference Engine in 1812 (Figure 3)

   b. Computed mathematical tables such as logarithms

   (NOTE: A logarithm is a system of exponentiation used to shorten calculations in mathematics.)

   c. Designed the Analytical Engine in 1833 but never built it

   (NOTE: The Analytical Engine would have contained all the basic parts of a modern general purpose digital computer: control, arithmetic unit, memory, input, and output.)

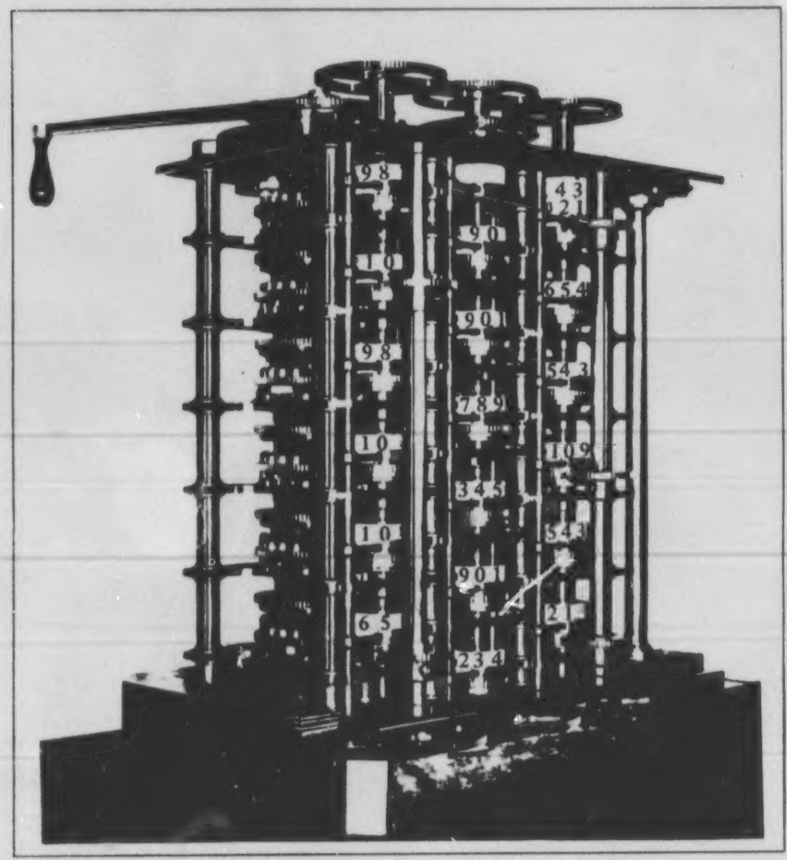

FIGURE 3 Babbage's Difference Machine

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INFORMATION SHEET

6. Herman Hollerith

   a. Developed the punch card, code, and tabulatory equipment to process the card for the U.S. 1890 Census (Figure 4)

   b. Established the Tabulating Machine Company in 1896

   (NOTE: The Tabulating Machine Company later became one of the parent companies of IBM.)

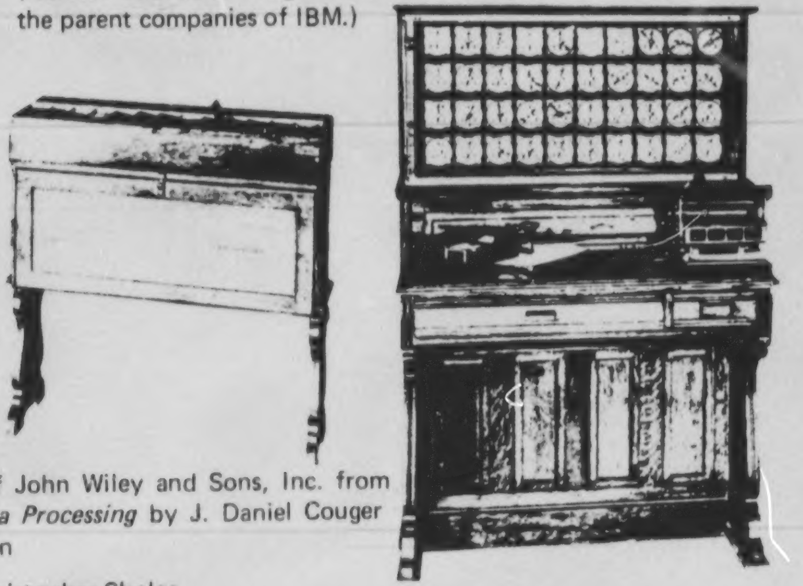


FIGURE 4

Hollerith's Electric Tabulating Machine

Used by permission of John Wiley and Sons, Inc. from *A First Course in Data Processing* by J. Daniel Couger and Fred R. McFadden

7. Christopher Sholes

   a. Developed the first typewriter that was perfected to such a degree that it was an improvement over handwriting

   b. Operated at a speed faster than a person could write and its letters were always legible

8. Alexander Graham Bell, Charles Painter, and Chickester Bell--Devised the first machine for commercially recording and reproducing sound in the late 1800's

B. 1900-1960

1. Voice recording equipment

   a. Thomas Alva Edison–Developed the world's first voice-recording machine around the turn of the century

   b. Sound recorded on a wax-covered cylinder

INFORMATION SHEET

2. Electric typewriter
   - a. Developed during the 1920's
   - b. Increased operating speed, improved the appearance of the work produced, and reduced the effort required over the manual typewriter
3. Autotypist
   - a. Developed in the 1930's
   - b. Used a perforated paper tape resembling a piano roll
   - c. When recording, a perforation was made for each typewriter key struck
   - d. No revisions were possible
4. Mark I (Automatic Sequence Controlled Calculator)
   - a. Developed by Howard H. Aiken and IBM in 1937
   - b. First major advancement since Babbage's work
   - c. Was slow and had a very limited storage capacity
   - d. Recognized as the world's first automatic machine
5. ENIAC (Electronic Numerical Integrator and Calculator) (Figure 5)
   - a. Developed by Dr. John W. Mauchly and J. Presper Eckert in the 1940's
   - b. First electronic computer which operated on vacuum tubes

     (NOTE: It is estimated that this computer contained 19,000 vacuum tubes.)
   - c. Occupied a space of 1500 square feet
   - d. Weighed 30 tons
   - e. Required 130 kilowatts of power

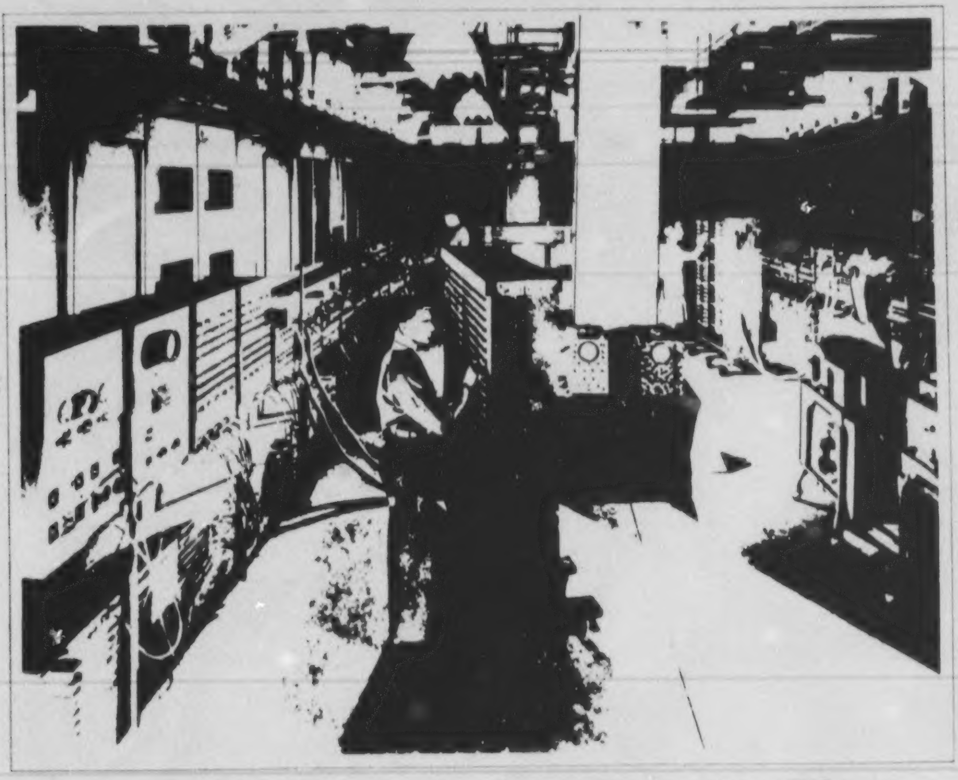
INFORMATION SHEET

f. Could perform 5,000 additions or 300 multiplications per second

g. Could perform several operations simultaneously

FIGURE 5

The ENIAC



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6. EDSAC (Electronic Delay Storage Automatic Calculator)
    a. Developed in 1949
    b. Incorporated the concept of the stored program
    c. Built at Cambridge University in England by a group of scientists headed by M.V. Wilkes
7. UNIVAC I
    a. Developed by Eckert and Mauchly in 1951
    b. First commercially available computer
    c. Used at the Bureau of the Census

INFORMATION SHEET

C. 1960-Present

1. Magnetic Tape Selectric Typewriter (MT/ST)
    - a. Developed by Ulrich Steinhilper in Germany in the mid 1960's
    - b. Introduced the concept of word processing
    - c. Eliminated the frustration of making corrections and revisions
    - d. Produced an attractive, error-free letter at increased speed
    - e. Used magnetic tape cartridge media
    - f. Predecessor to magnetic card typewriter
2. Cathode ray tube (CRT)
    - a. Developed in the late 1960's
    - b. Allows the operator to keyboard and edit text on a television-like screen
    - c. Allows text to be edited and revised before printing

III. Characteristics of four generations of computers

A. First generation

1. 1946 to 1959
2. Used vacuum tubes (Figure 6)
3. Expensive
4. Relatively slow and unreliable

INFORMATION SHEET

5. Required extensive air conditioning to dissipate the heat generated by the vacuum tubes

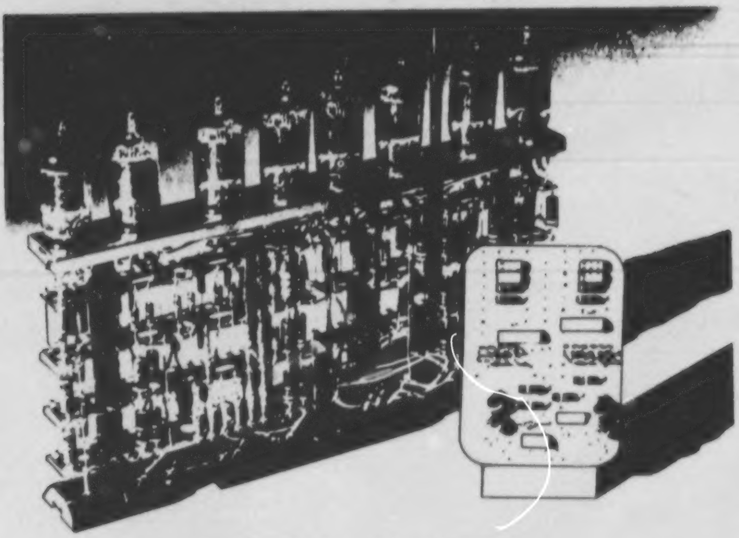

FIGURE 6 Vacuum Tubes

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B. Second generation

1. 1959-1964
2. Replaced vacuum tubes with transistors
3. Greater reliability
4. Transistors cheaper than vacuum tubes
5. Smaller size
6. Reduced power requirements and heat generation

C. Third generation

1. 1964 to present
2. Use magnetic cores and semiconductors
3. Smaller
4. Faster
5. More reliable

INFORMATION SHEET

D. Fourth generation

  1. Being developed at the present time
  2. Will have more advanced types of storage
  3. Will be smaller, faster, and less expensive than today's computers

HISTORY
UNIT II

ASSIGNMENT SHEET #1--COMPLETE A CHART ON THE HISTORY OF INFORMATION PROCESSING

Directions: Complete the blanks in the chart below with the words on the right.

YEAR	DEVICE/INVENTOR
Prior to 1600	Abacus
1600s	a. ____________________ Leibnitz
1800s	Jacquard b. ____________________ Hollerith Christopher Sholes Alexander Graham Bell, Charles Painter, and Chickester Bell
1900-1960	c. ____________________ Electric typewriter Autotypist d. ____________________ ENIAC EDSAC e. ____________________
1960-Present	Magnetic Tape Selectric Typewriter f. ____________________

Cathode ray tube

Mark I

Pascal--1st Calculating Machine

Edison--Voice Recorder

Babbage--Difference Engine

UNIVAC I

HISTORY
UNIT II

ANSWERS TO ASSIGNMENT SHEET #1

a. Pascal--1st Calculating Machine

b. Babbage--Difference Engine

c. Edison--Voice Recorder

d. Mark I

e. UNIVAC I

f. Cathode Ray Tube

HISTORY
UNIT II

NAME ______________________________

TEST

1. Match the terms on the right with the correct definitions.

_____a. Medium on which data is recorded in the form of magnetized spots on the surface of magnetically sensitive coated tape

_____b. Means by which information is reported from computer storage in a form that can be understood by human beings or in a form suitable for use as input for another computer system

_____c. Input/output device consisting of a typewriter keyboard, and often a CRT, enabling its user to have direct contact with the system

_____d. A container holding magnetic tape that can be processed without separating it from the container

_____e. The combination of people, procedures, and equipment that transforms ideas into printed communications and helps facilitate the flow of related office work

_____f. A tiny doughnut-shaped element about the size of a grain of salt, which is capable of being magnetized in a clockwise or counter-clockwise direction

_____g. Small solid-state semiconductors, used as a basic building block in the circuitry of second-generation computers

_____h. A storage medium in which data is represented by means of holes punched in vertical columns in a paper card

_____i. A continuous paper tape recording medium, containing rows of punched holes that represent a code for letters, digits, and symbols

1. Arithmetic/logic unit
2. Control unit
3. Input
4. Word processing
5. Magnetic core
6. Magnetic tape
7. Magnetic tape cartridge medium
8. Memory
9. Output
10. Paper tape
11. Punched cards
12. Semiconductor
13. Terminal
14. Transistors
15. Vacuum tube

______j. Storage that consists of many wired silicon chips with on-off switches that direct the current that is passing through the storage locations

______k. A sealed tube or bulb from which almost all the air has been removed

______l. Entering data into the computer

______m. A major component of the computer that performs all arithmetic and logical operations under the direction of the control unit

______n. The main storage area of the information processing system that holds all programs and data being processed

______o. Oversees the processing activities of the entire computer system

2. Match the names of inventors and inventions with achievements that were important to the development of information processing.

(NOTE: The names on this page should be matched with achievements a though h. The names on the following page should also be matched with those achievements.)

______a. Devised the first machine for commercially recording and reproducing sound in the late 1800's

______b. Allows the operator to keyboard and edit text on a television-like screen

______c. Developed the first practical calculating machine in 1642

______d. Used a perforated paper tape resembling a piano roll

______e. Developed the first typewriter that was perfected to such a degree that it was an improvement over handwriting

______f. Recognized as the world's first automatic machine

______g. Machine which introduced the concept of word processing

______h. Developed the Difference Engine in 1812

1. Pascal
2. Autotypist
3. Charles Babbage
4. Alexander Graham Bell
   Charles Painter
   Chickester Bell
5. Cathode ray tube
6. Christopher Sholes
7. Mark I
8. Magnetic Tape Selectric Typewriter

______i. One of the earliest known computation devices

______j. Developed the world's first voice-recording machine around the turn of the century

______k. Developed the punch card, code, and tabulatory equipment to process the card for the U.S. 1890 Census

______l. Developed the first calculator which could add, subtract, multiply, and divide

______m. First electronic computer which operated on vacuum tubes

______n. Developed the automated loom which was the forerunner of Herman Hollerith's punched card

______o. Incorporated the concept of the stored program

______p. Increased operating speed, improved the appearance of the work produced, and reduced the effort required over the manual typewriter

______q. First commercially available computer

9. ENIAC
10. Herman Hollerith
11. Jacquard
12. Leibnitz
13. Electric typewriter
14. EDSAC
15. Abacus
16. Thomas Alva Edison
17. UNIVAC I

3. Distinguish between the characteristics of the first, second, third, and fourth generations of computers by placing a "1" for first generation, a "2" for second generation, a "3" for third generation, and a "4" for fourth generation in the space provided.

______a. Will be smaller, faster, and less expensive than today's computers

______b. Replaced vacuum tubes with transistors

______c. Use magnetic cores and semiconductors

______d. Used vacuum tubes

______e. Covers the period of 1964 to the present

______f. Reduced power requirements and heat generation

______g. Required extensive air conditioning to dissipate the heat generated by the vacuum tubes

4. Complete a chart on the history of information processing.

(NOTE: If this activity has not been accomplished prior to the test, ask your instructor when it should be completed.)

HISTORY
UNIT II

ANSWERS TO TEST

1. a. 6
   b. 9
   c. 13
   d. 7
   e. 4
   f. 5
   g. 14
   h. 11
   i. 10
   j. 12
   k. 15
   l. 3
   m. 1
   n. 8
   o. 2

2. a. 4
   b. 5
   c. 1
   d. 2
   e. 6
   f. 7
   g. 8
   h. 3
   i. 15
   j. 16
   k. 10
   l. 12
   m. 9
   n. 11
   o. 14
   p. 13
   q. 17

3. a. 4
   b. 2
   c. 3
   d. 1
   e. 3
   f. 2
   g. 1

4. Evaluated to the satisfaction of the instructor

BASIC COMPONENTS OF AN INFORMATION SYSTEM
UNIT III

UNIT OBJECTIVE

After completion of this unit, the student should be able to distinguish between functions of the control unit, main memory, and arithmetic/logic unit of a CPU. The student should also be able to sketch the configuration of a computer system, locate terms associated with an information system, and indicate the flow of data through the system. This knowledge will be evidenced by correctly performing the procedures outlined on the assignment sheets and by scoring 85 percent on the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms associated with the basic components of an information system with the correct definitions.
2. Label the components of the computer on a schematic diagram.
3. Distinguish between functions of the control unit, main memory, and arithmetic/logic unit of a CPU.
4. Arrange in order the process of the flow of information through the central processing unit from input to output.
5. Match the types of main memory with their characteristics.
6. Match the types of secondary storage devices with their characteristics.
7. Sketch the configuration of a computer system.
8. Locate terms associated with the components of an information system.
9. Indicate the flow of data involved in the adding of six numbers and computing the average.

BASIC COMPONENTS OF AN INFORMATION SYSTEM
UNIT III

SUGGESTED ACTIVITIES

I. Provide student wi[illegible] objective sheet.

II. Provide student with information and assignment sheets.

III. Discuss unit and specific objectives.

IV. Discuss information and assignment sheets.

V. Visit an information processing operation.

VI. Obtain a programmable calculator and demonstrate the processes of input/processing/output in this unit.

VII. Obtain, if possible, a hand-held computer to use in this unit.

VIII. Give test.

INSTRUCTIONAL MATERIALS

I. Included in this unit:

  A. Objective sheet

  B. Information sheet

  C. Transparency Master 1--Basic Components of the Computer

  D. Assignment Sheets

    1. Assignment Sheet #1--Sketch the Configuration of a Computer

    2. Assignment Sheet #2--Locate Terms Associated With The Components of an Information System

    3. Assignment Sheet #3--Indicate the Flow of Data Involved in the Adding of Six Numbers and Computing the Average

  E. Test

  F. Answers to Test

II. References:

A. Spencer, Donald D. *Data Processing: An Introduction.* Columbus, OH: Charles E. Merrill Publishing Company, 1978.

B. Cougar, J. Daniel, and Fred McFadden. *A First Course in Data Processing.* New York: John Wiley & Sons, 1977.

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E. Wanous, S. J., Gerald E. Wagner, and Stephen F. Hallam. *Introduction to Automated Data Processing.* Second Edition. Dallas: South-Western Publishing Company, 1979.

BASIC COMPONENTS OF AN INFORMATION SYSTEM
UNIT III

INFORMATION SHEET

I. Terms and definitions

A. Input--Means by which data from keyboards, punched cards, punched paper tape, along with magnetic ink characters, printed characters, and other magnetic devices are entered into an information processing system

B. Central processing unit (CPU)--The major component of a computer system, responsible for processing all data handled by the system; consists of the control unit, arithmetic/logic unit, and main memory

C. Output--Means by which information is reported from computer storage in a form that can be understood by human beings or in a form suitable for use as input for later processing

D. Control unit--Regulates the processing activities of the computer system; executes instructions from programs, monitors the movement of data in storage, allocates storage positions, and coordinates input/output activities

E. Main memory--The main storage area of the central processing unit that holds the program and data being processed

(NOTE: Main memory is also referred to as internal memory, core, and primary storage)

F. Byte--A storage unit; normally holds one character

G. Word--A storage unit that can hold one or more bytes

(NOTE: Data may be stored in the format of either a byte or word.)

H. Arithmetic/logic unit--A major component of the central processing unit which performs all arithmetic and logical operations under the direction of the control unit

I. Magnetic core--A tiny doughnut-shaped element about the size of a grain of salt, which is capable of being magnetized in either a clockwise or counter-clockwise direction

J. Semiconductor--Storage that consists of many wired silicon chips with on-off switches that direct the current that is passing through the storage location

K. Random Access Memory (RAM)--Main storage areas used with microcomputers, minicomputers, and text-editing equipment into which data can be written or read

INFORMATION SHEET

L. Read Only Memory (ROM)--Storage areas used with microcomputers, minicomputers, and text-editing equipment that permit data to be read from them because they are permanently wired to perform one function or contain specific data

M. Programmable Read Only Memory (PROM)--Storage area in microcomputers and minicomputers that contains monitors, input/output devices, and special application programs

N. Erasable Programmable Read Only Memory (EPROM)--One of the most current types of monolithic memories that can be programmed by the user and erased and reprogrammed with different information

(NOTE: Monolithic means formed from a single crystal.)

O. Secondary storage--A supplementary means for storing large quantities of data and programs; separate from but directly attached to the central processing unit and stores data in a format that is compatible with data held in primary storage

(NOTE: Secondary storage is also referred to as auxiliary storage.)

P. Magnetic tape--Medium on which data is recorded in the form of magnetized spots on the surface of magnetically sensitive coated tape

Q. Magnetic disks--Thin metal disks coated on each side so that data can be recorded in the form of magnetized spots

R. Magnetic bubble memory--An advanced data storage technique in which microscopic magnetized bubbles, representing data, are stored on the surface of a magnetic film

S. Chips--Miniaturized integrated circuits which compose ROM memory

T. Logical operation--An operation performed to compare the relationship between numeric or nonnumeric data and make a logical decision

U. Program--A complete set of instructions that directs the information processor and coordinates the operation of the various components

II. Basic components of the computer (Transparency 1)

A. Input device

B. CPU (central processing unit)

1. Control unit
2. Main memory
3. Arithmetic/logic unit

C. Output device

INFORMATION SHEET

III. Functions of the CPU

A. Control unit

1. Oversees the processing activities of the entire system
2. Executes instructions from programs
3. Allocates storage positions
4. Monitors the movement of data in storage
5. Coordinates input/output activities

B. Main memory

1. Stores input data
2. Stores instructions from programs currently undergoing processing
3. Stores data resulting from processing
4. Stores data in preparation for output

C. Arithmetic/logic unit

1. Performs arithmetic operations
    a. Addition
    b. Subtraction
    c. Multiplication
    d. Division
    e. Exponentiation
2. Performs logical operations
    a. Greater than
    b. Less than
    c. Equal to
    d. Not equal to
    e. Greater than or equal to
    f. Less than or equal to

INFORMATION SHEET

IV. Flow of information through the central processing unit (Transparency 1)

A. Information entered into main memory through an input device

B. The control unit directs the flow of control of data within the CPU through instructions received from a stored program

C. Control unit directs movement of data from main memory to arithmetic/logic unit when an arithmetic or logical operation is required

D. Result of arithmetic or logical operation is then transferred back to main memory where it awaits further processing or output

E. Data output from main memory as directed by the control unit

V. Types of main memory and characteristics

A. Magnetic core memory

1. Tiny, doughnut-shaped ferromagnetic rings strung on screen of wire

(NOTE: Ferro means iron.)

2. Compact size

(NOTE: The size of the magnetic core memory is comparable to a grain of salt. See Figure 1.)

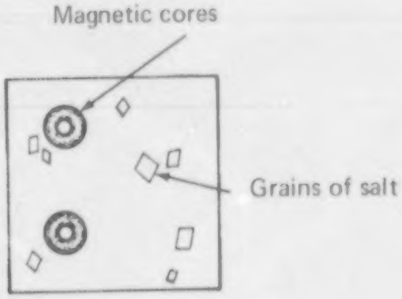


Figure 1

INFORMATION SHEET

3. Electrical current passes through core to store data in either bytes or words (Figure 2)

   a. Clockwise polarization represents "O"

   b. Counterclockwise polarization represents "1"

   (NOTE: Positive and negative polarization of "O" and "1" may be reversed on some systems.)

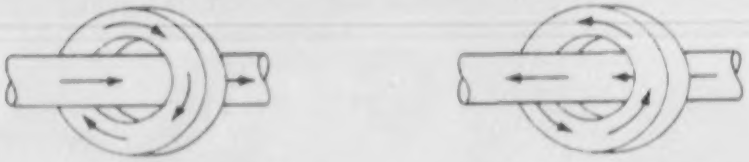

Core is magnetized to represent '0'
Core is magnetized to represent '1'

Figure 2

Polarization of magnetic cores

4. Magnetic cores strung together in planes (Figure 3)

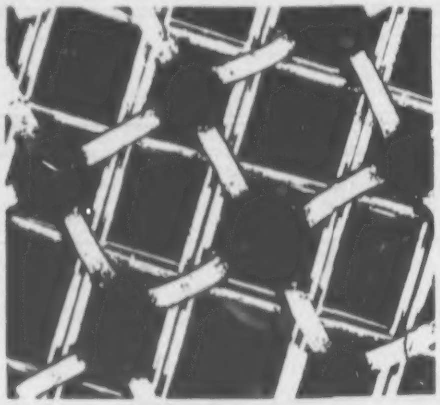


FIGURE 3

Plane of Magnetic Cores

Courtesy IBM Corporation

B. Semiconductor memory (Figures 4 and 5)

1. Replaced transistors of the second generation of computers

2. Uses silicon chips with interconnecting on-off switches

   (NOTE: On-off switches are called flip-flops.)

INFORMATION SHEET

3. Provides increased storage capacity
4. Used as internal memory in minicomputers and microcomputers

Courtesy IBM

FIGURE 4
Semiconductor Memory Chip

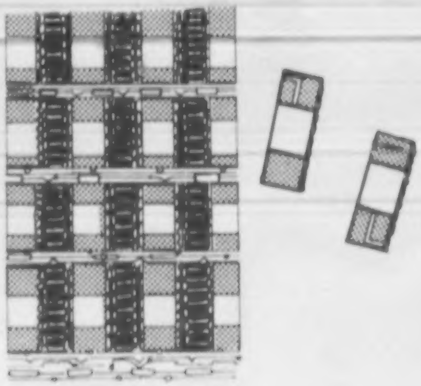


FIGURE 5
Blow-up of a Metal Oxide Semiconductor Memory Board

C. Random Access Memory (RAM)

1. Most common and least expensive micro-minicomputer memory
2. Used to store user programs and data
3. Contents lost when power is shut off

D. Read Only Memory (ROM)

1. Not possible to write in
2. Not user programmable
3. Contents placed into memory by manufacturer

E. Programmable Read Only Memory (PROM)

1. Retains contents in memory when power is shut off
2. Can be purchased blank and programmed by user
3. Once programmed it cannot be erased
4. Once programmed, becomes same as ROM

INFORMATION SHEET

F. Erasable Programmable Read Only Memory (EPROM)

1. Programmed by user
2. May be erased and reprogrammed
3. Once programmed, acts same as ROM

(NOTE: The programming of PROM and EPROM must be done using a special machine called a PROM programmer or PROM burner.)

VI. Secondary storage

A. Magnetic tape (Figure 6)

1. Approximately 600 to 2400 feet long
2. Plastic coated with a magnetizable surface
3. Used primarily for storage of large amounts of data

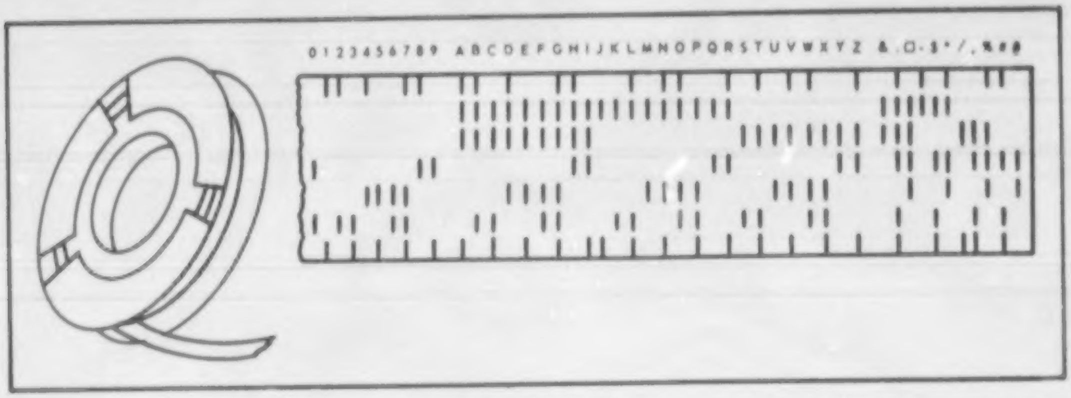


FIGURE 6 Magnetic Tape

Used by permission of South-Western Publishing Company from *Fundamentals of Data Processing* by S. J. Wanous, E. E. Wanous, and Gerald E. Wagner.

B. Magnetic disk (Figure 7)

1. Thin metal disks coated with a ferrous oxide material that is magnetized to record data

INFORMATION SHEET

2. Individual disks similar in appearance to phonograph record
3. Individual disks are mounted vertically on a spindle

   (NOTE: These are called disk cartridges or disk packs.)
4. Most commonly used form for storing large amounts of data

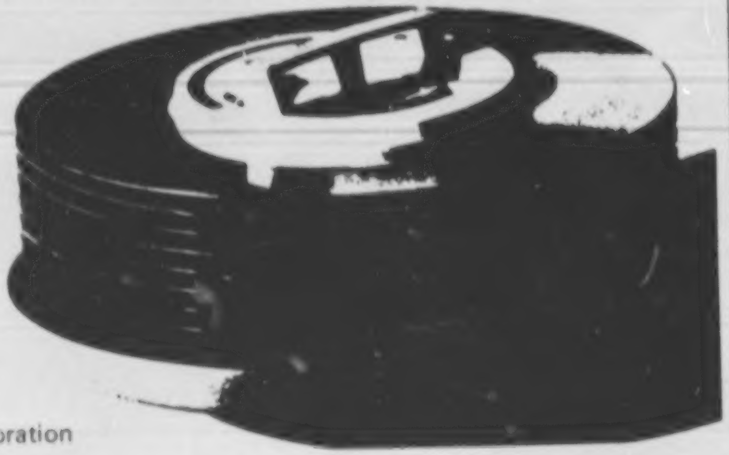


FIGURE 7

Magnetic Disk

Courtesy IBM Corporation

C. Magnetic floppy disk (Figure 8)

1. Small and pliable
2. Resembles miniature record without grooves
3. Easy handling and storage
4. Inexpensive
5. Stored in paper or plastic

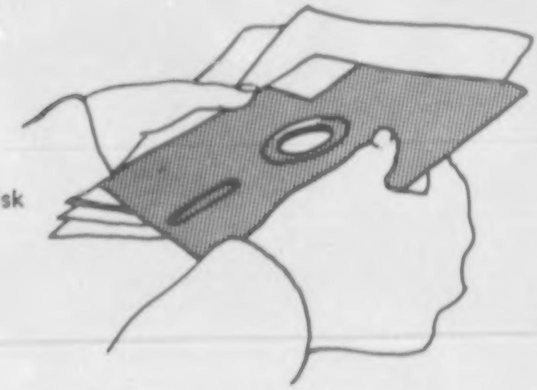


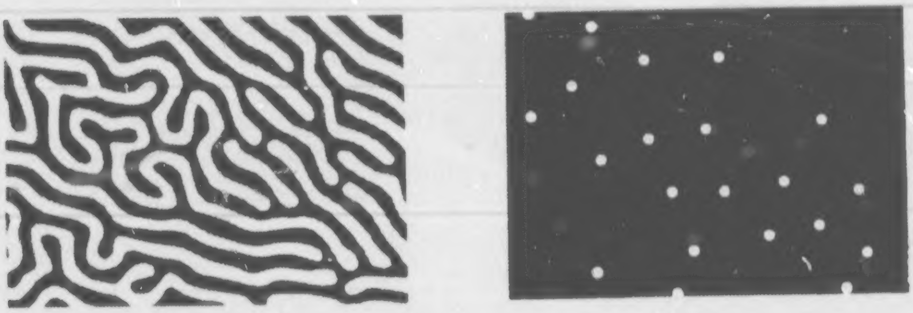
FIGURE 8

Magnetic Floppy Disk

INFORMATION SHEET

D. Magnetic bubble memory (Figure 9)

1. Uses microscopic bubbles on magnetic film
2. Film magnetized to create bubbles which stand out to create data images
3. Retains information when power is turned off



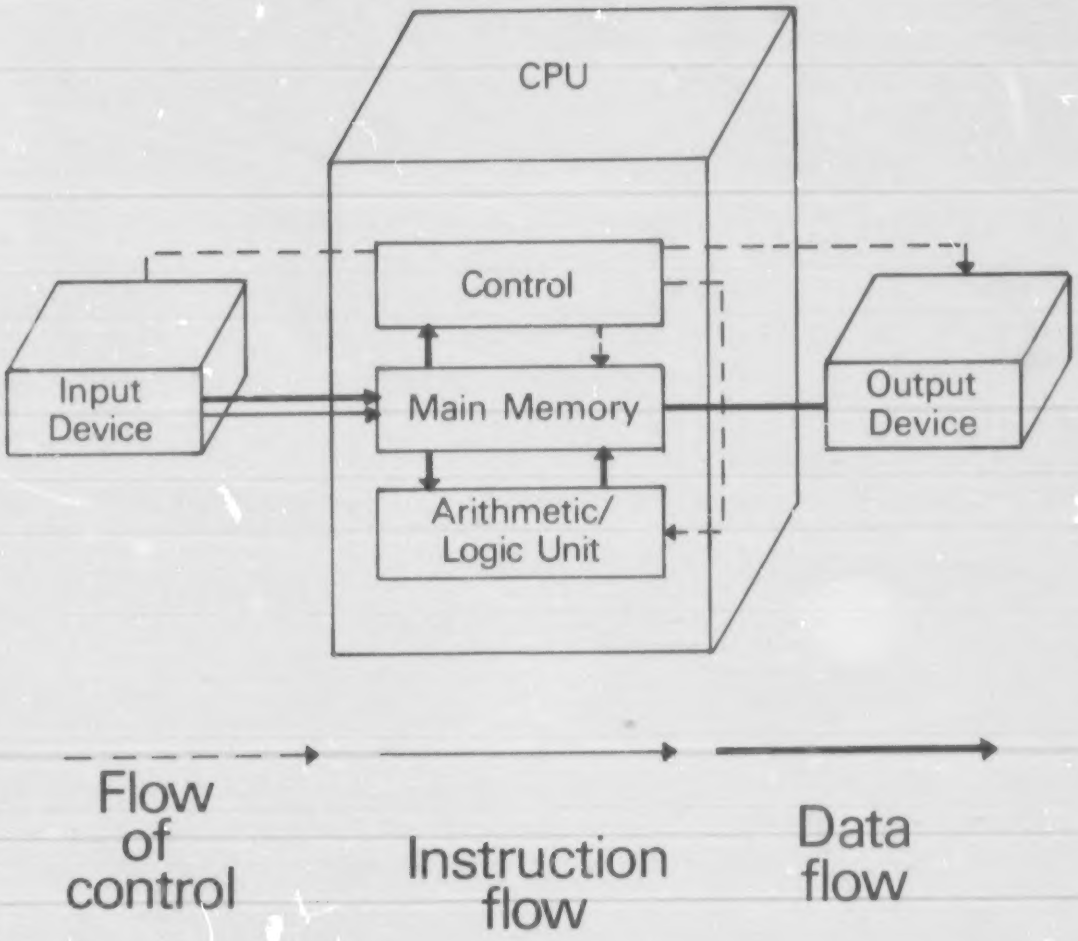
Before Data Stored

After Data Stored

FIGURE 9

Magnetic Bubble Memory

Basic Components of the Computer


CPU
Control
Input Device
Main Memory
Output Device
Arithmetic/ Logic Unit
Flow of control
Instruction flow
Data flow

BASIC COMPONENTS OF AN INFORMATION SYSTEM
UNIT III

ASSIGNMENT SHEET #1--SKETCH THE CONFIGURATION OF A COMPUTER SYSTEM

Directions: In the space provided below, sketch the configuration of the components of a computer system.

BASIC COMPONENTS OF AN INFORMATION SYSTEM
UNIT III

ASSIGNMENT SHEET #2--LOCATE TERMS ASSOCIATED WITH THE COMPONENTS OF AN INFORMATION SYSTEM

Directions: Using the definitions on the following page, circle the terms which correspond to their definitions.

A	G	E	P	A	T	C	I	T	E	N	G	A	M	D	K	O	S	E	L	X
Y	R	O	M	E	M	E	L	B	B	U	B	C	I	T	E	N	G	A	M	J
U	H	D	Y	M	A	G	N	E	T	I	C	D	I	S	K	S	A	U	T	W
A	R	I	T	H	M	E	T	I	C	/	L	O	G	I	C	U	N	I	T	C
X	B	V	G	J	A	H	L	S	Y	P	T	F	K	O	U	N	Q	V	T	S
N	F	Z	D	O	D	G	J	C	G	B	U	P	Y	R	W	L	A	Z	I	M
C	E	I	E	W	C	K	R	T	Q	P	M	H	R	N	I	Q	X	F	N	E
R	Y	E	L	S	O	D	O	M	A	I	N	M	E	M	O	R	Y	E	U	B
A	R	T	G	W	N	U	H	G	V	E	F	D	L	A	X	Z	C	A	G	Y
N	O	I	K	A	T	J	N	S	L	R	M	Z	O	G	Q	P	W	T	N	A
D	M	Z	A	F	R	K	P	N	R	O	A	H	U	N	G	G	C	L	I	E
O	E	H	S	C	O	O	L	Q	J	U	D	M	P	E	S	K	L	M	S	J
M	M	J	G	E	L	W	T	A	B	N	L	I	F	T	Q	F	Q	A	S	X
A	Y	D	B	Y	U	M	X	S	K	J	O	R	B	I	P	Z	I	X	E	H
C	L	N	T	I	N	V	C	T	Y	W	Q	X	V	C	Z	P	V	H	C	D
C	N	L	K	O	I	I	A	U	S	R	E	B	O	C	R	R	N	S	O	O
E	O	P	U	M	T	F	X	Z	F	V	A	Y	U	O	E	W	U	X	R	Y
S	D	R	Q	F	I	B	D	R	W	E	I	D	A	R	Z	G	Z	E	P	U
S	A	M	N	O	E	H	Y	G	I	H	O	G	N	E	B	A	T	Y	L	R
M	E	G	T	Q	J	C	L	K	N	N	D	J	M	O	H	C	D	J	A	W
E	R	F	U	P	M	R	N	S	P	K	L	P	Q	C	C	T	X	M	R	V
M	E	B	E	Z	R	O	T	C	U	D	N	O	C	I	M	E	S	E	T	A
O	R	D	G	A	Z	U	V	Y	T	X	S	M	O	F	Q	L	S	C	N	B
R	K	H	V	W	P	X	Y	T	U	E	W	D	N	I	K	P	R	L	E	F
Y	N	C	I	T	M	A	G	N	E	T	I	C	D	R	U	M	M	B	C	K
B	Q	J	U	O	Y	T	Z	U	A	V	B	C	W	J	C	A	E	C	H	I
Y	R	O	P	S	X	L	L	L	E	C	A	T	A	D	D	H	G	I	F	S

ASSIGNMENT SHEET #2

1. Storage that consists of many wired silicon chips with on-off switches that direct the current that is passing through the storage location

2. A supplementary means for storing large quantities of data and programs; separate from but directly attached to the central processing unit and stores data in a format that is compatible with data held in primary storage

3. Means by which data from keyboards, punched cards, punched paper tape, along with magnetic ink characters, printed characters, and other magnetic devices are entered into an information processing system

4. Regulates the processing activities of the computer system; executes instructions from programs, monitors the movement of data in storage, allocates storage positions, and coordinates input/output activities

5. An advanced data storage technique in which microscopic magnetized bubbles, representing data, are stored on the surface of a magnetic film

6. A major component of the central processing unit which performs all arithmetic and logical operations under the direction of the control unit

7. Medium on which data is recorded in the form of magnetized spots on the surface of magnetically sensitive coated tape

8. Means by which information is reported from computer storage in a form that can be understood by human beings or in a form suitable for use as input for later processing

9. Thin metal disks coated on each side so that data can be recorded in the form of magnetized spots

10. Main storage areas used with microcomputers, minicomputers, and text-editing equipment into which data can be written or read

11. The main storage area of the central processing unit that holds the program and data being processed

12. The major component of a computer system, responsible for processing all data handled by the system; consists of the control unit, arithmetic/logic unit, and main memory

13. Storage areas used with microcomputers, minicomputers, and text-editing equipment that permit data to be read from them because they are permanently wired to perform one function or contain specific data

14. A tiny doughnut-shaped element about the size of a grain of salt, which is capable of being magnetized in either a clockwise or counterclockwise direction

BASIC COMPONENTS OF AN INFORMATION SYSTEM
UNIT III

ASSIGNMENT SHEET #3--INDICATE THE FLOW OF DATA INVOLVED IN THE ADDING OF SIX NUMBERS AND COMPUTING THE AVERAGE

Directions: Using the figure below, indicate the direction of the data flow of questions 1 - 5 by placing the letter representing the direction of the data flow in the space provided.

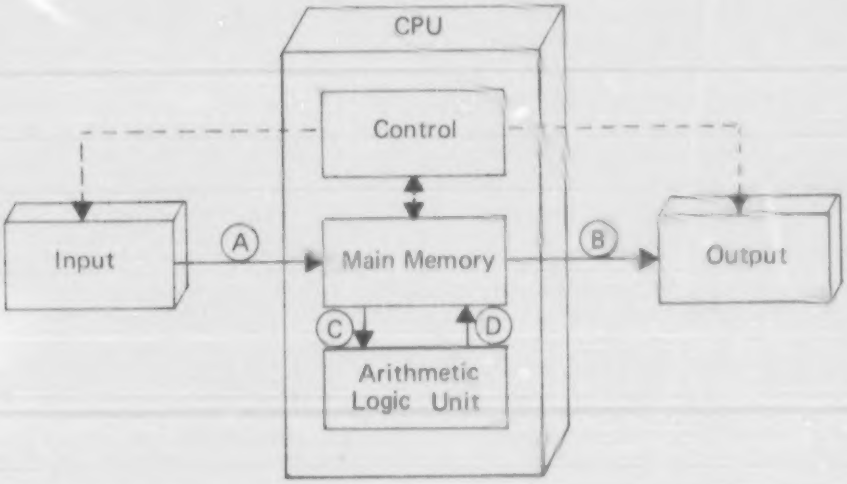
_____1. Read into the computer 6 numbers

_____2. Add the numbers together

_____3. Store the sum of the addition

_____4. Divide the sum by 6

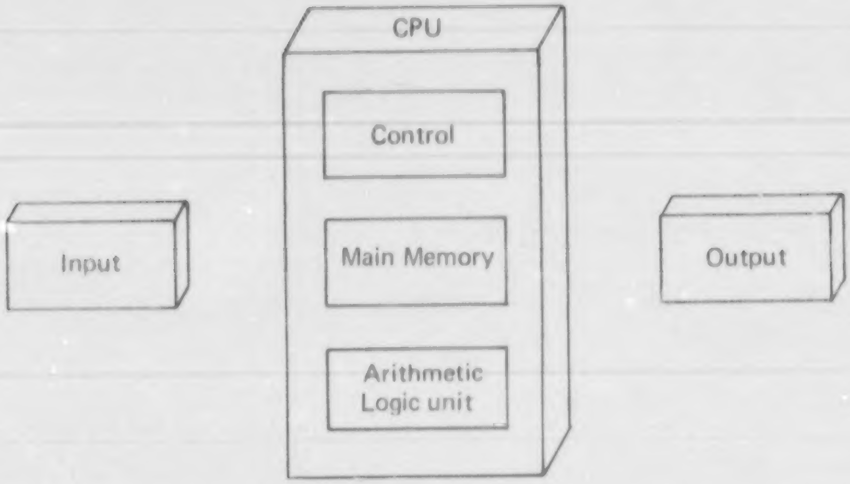
_____5. Print out the result


CPU
Control
Input
Ⓐ
Main Memory
Ⓑ
Output
Ⓒ
Ⓓ
Arithmetic Logic Unit

BASIC COMPONENTS OF AN INFORMATION SYSTEM
UNIT III

ANSWERS TO ASSIGNMENT SHEETS

Assignment Sheet #1


CPU
Control
Main Memory
Arithmetic Logic unit
Input
Output

Assignment Sheet #2

A	G	E	P	A	T	C	I	T	E	N	G	A	M	D	K	O	S	E	L	X
Y	R	O	M	E	M	E	L	B	B	U	B	C	I	T	E	N	G	A	M	J
U	H	D	Y	M	A	G	N	E	T	I	C	D	I	S	K	S	A	U	T	W
A	R	I	T	H	M	E	T	I	C	/	L	O	G	I	C	U	N	I	T	C
X	B	V	G	J	A	H	L	S	Y	P	T	F	K	O	U	N	Q	V	T	S
N	F	Z	D	O	D	G	J	C	G	B	U	P	Y	R	W	L	A	Z	I	M
C	E	I	E	W	C	K	R	T	Q	P	M	H	R	N	I	Q	X	F	N	E
R	Y	E	L	S	O	D	O	M	A	I	N	M	E	M	O	R	Y	E	U	B
A	R	T	G	W	N	U	H	G	V	E	F	D	L	A	X	Z	C	A	G	Y
N	O	I	K	A	T	J	N	S	L	R	M	Z	O	G	Q	P	W	T	N	A
D	M	Z	A	F	R	K	P	N	R	O	A	H	U	N	G	G	C	L	I	E
O	E	H	S	C	O	O	L	Q	J	U	D	M	P	E	S	K	L	M	S	J
M	M	J	G	E	L	W	T	A	B	N	L	I	F	T	Q	F	Q	A	S	X
A	Y	D	B	Y	U	M	X	S	K	J	O	R	B	I	P	Z	I	X	E	H
C	L	N	T	I	N	V	C	T	Y	W	Q	X	V	C	Z	P	V	H	C	D
C	N	L	K	O	I	I	A	U	S	R	E	B	O	C	R	R	N	S	O	O
E	O	P	U	M	T	F	X	Z	F	V	A	Y	U	O	E	W	U	X	R	Y
S	D	R	Q	F	I	B	D	R	W	E	I	D	A	R	Z	G	Z	E	P	U
S	A	M	N	O	E	H	Y	G	I	H	O	G	N	E	B	A	T	Y	L	R
M	E	G	T	Q	J	C	L	K	N	N	D	J	M	O	H	C	D	J	A	W
E	R	F	U	P	M	R	N	S	P	K	L	P	Q	C	C	T	X	M	R	V
M	E	B	E	Z	R	O	T	C	U	D	N	O	C	I	M	E	S	E	T	A
O	R	D	G	A	Z	U	V	Y	T	X	S	M	O	F	Q	L	S	C	N	B
R	K	H	V	W	P	X	Y	T	U	E	W	D	N	I	K	P	R	L	E	F
Y	N	C	I	T	M	A	G	N	E	T	I	C	D	R	U	M	M	B	C	K
B	Q	J	U	O	Y	T	Z	U	A	V	B	C	W	J	C	A	E	C	H	I
Y	R	O	P	S	X	L	L	L	E	C	A	T	A	D	D	H	G	I	F	S

Assignment Sheet #2

1. Semiconductor
2. Secondary storage
3. Input
4. Control unit
5. Magnetic bubble memory
6. Arithmetic/logic unit
7. Magnetic tape
8. Output
9. Magnetic disks
10. Random Access Memory
11. Main memory
12. Central processing unit
13. Read Only Memory
14. Magnetic core

Assignment Sheet #3

1. A
2. C
3. D
4. C
5. B

BASIC COMPONENTS OF AN INFORMATION SYSTEM
UNIT III

NAME ______________________________

TEST

1. Match the terms on the right with the correct definitions.

______a. A complete set of instructions that directs the information processor and coordinates the operation of the various components

______b. The major component of a computer system, responsible for processing all data handled by the system; consists of the control unit, arithmetic/logic unit, and main memory

______c. The main storage area of the central processing unit that holds the program and data being processed

______d. A major component of the central processing unit which performs all arithmetic and logical operations under the direction of the control unit

______e. Means by which information is reported from computer storage in a form that can be understood by human beings or in a form suitable for use as input for later processing

______f. A storage unit; normally holds one character

______g. Miniaturized integrated circuits which compose ROM memory

______h. An advanced data storage technique in which microscopic magnetized bubbles, representing data, are stored on the surface of a magnetic film

______i. Regulates the processing activities of the entire computer system; executes instructions from programs, monitors the movement of data in storage, allocates storage positions, and coordinates input/output activities

1. Arithmetic/logic unit
2. Byte
3. Central processing unit
4. Chips
5. Control unit
6. Word
7. Erasable Programmable Read Only Memory (EPROM)
8. Input
9. Logical operation
10. Magnetic bubble memory
11. Magnetic core
12. Magnetic disks
13. Semiconductor
14. Magnetic tape
15. Main memory
16. Output
17. Program
18. Programmable Read Only Memory (PROM)
19. Random Access Memory (RAM)
20. Read Only Memory (ROM)
21. Secondary storage

______j. Means by which data from keyboards, punched cards, punched paper tape, along with magnetic ink characters, printed characters, and other magnetic devices are entered into an information processing system

______k. Medium on which data is recorded in the form of magnetized spots on the surface of magnetically sensitive coated tape

______l. A supplementary means for storing large quantities of data and programs; separate from but directly attached to the central processing unit and stores data in a format that is compatible with data held in primary storage

______m. Main storage areas used with microcomputers, minicomputers, and text-editing equipment into which data can be written or read

______n. Thin metal disks coated on each side so that data can be recorded in the form of magnetized spots

______o. Storage that consists of many wired silicon chips with on-off switches that direct the current that is passing through the storage location

______p. One of the most current types of monolithic memories that can be programmed by the user and erased and reprogrammed with different information

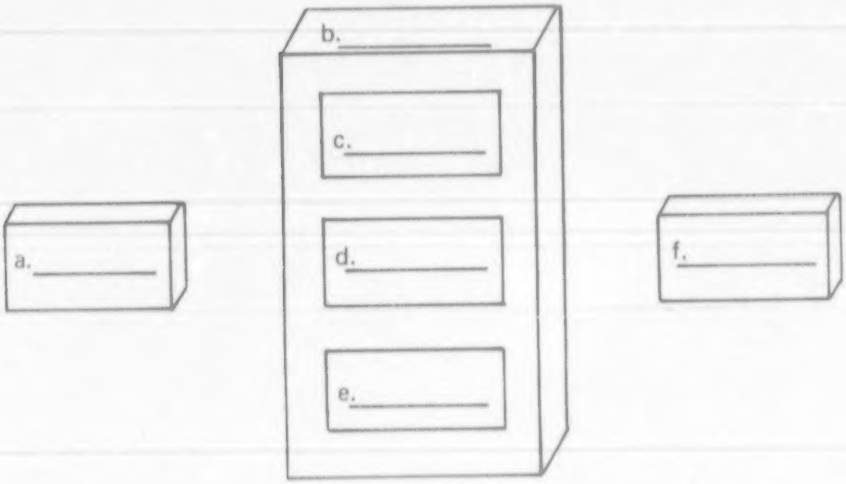
______q. A storage unit that can hold one or more bytes

______r. A tiny doughnut-shaped element about the size of a grain of salt, which is capable of being magnetized in either a clockwise or counterclockwise direction

______s. Storage area used with microcomputers, minicomputers, and text-editing equipment that permit data to be read from them because they are permanently wired to perform one function or contain specific data

______t. An operation performed to compare the relationship between numeric or nonnumeric data and make a logical decision _____u. Storage area in microcomputers and minicomputers that contains monitors, input/output devices, and special application programs

2. Label the components of the computer on the following schematic diagram.



3. Distinguish between the functions of the control unit, main memory, and arithmetic/logic unit of a CPU by placing an "C" for control unit, "M" for main memory, and "A" for arithmetic/logic unit to the left of the function.

_____a. Stores input data

_____b. Performs arithmetic operations

_____c. Oversees the processing activities of the entire system

_____d. Allocates storage positions

______e. Stores instructions from programs currently undergoing processing

______f. Executes instructions from programs

______g. Performs logical operations

______h. Monitors the movement of data in storage

______i. Stores data in preparation for output

______j. Coordinates input/output activities

______k. Stores data resulting from processing

4. Arrange in order the process of the flow of information through the central processing unit from input to output by numbering from one to five.

______a. Result of arithmetic or logical operation is then transferred back to main memory where it awaits further processing or output

______b. Data output from main memory as directed by the control unit

______c. Information entered into main memory through an input device

______d. The control unit directs the flow of control of data within the CPU through instructions received from a stored program

______e. Control unit directs movement of data from main memory to arithmetic/logic unit when an arithmetic or logical operation is required

5. Match the types of main memory on the right with their characteristics.

______a. Uses silicon chips with interconnecting on-off switches

______b. Not possible to write in

______c. May be erased and reprogrammed; once programmed, acts same as ROM

______d. Can be purchased blank and programmed by the user; once programmed it cannot be erased

______e. Used to store user programs and data

______f. Tiny, doughnut-shaped ferromagnetic rings strung on screen of wire

1. Magnetic core memory
2. Semiconductor memory
3. RAM
4. ROM
5. PROM
6. EPROM

6. Match the types of secondary storage devices on the right with their correct characteristics.

_____a. Film magnetized to create bubbles which stand out to create data images

_____b. Thin metal disks coated with a ferrous oxide material that is magnetized to record data

_____c. Resembles miniature record without grooves

_____d. Plastic coated with a magnetizable surface; approximately 600 to 2400 feet long

1. Magnetic tape
2. Magnetic disk
3. Magnetic floppy disk
4. Magnetic bubble memory

7. Sketch the configuration of a computer system.

8. Locate terms associated with the components of an information system.

9. Indicate the flow of data involved in the adding of six numbers and computing the average.

(NOTE: If these activities have not been completed prior to the test, ask your instructor when they should be completed.)

BASIC COMPONENTS OF AN INFORMATION SYSTEM
UNIT III

ANSWERS TO TEST

1. a. 17 f. 2 k. 14 p. 7
b. 3 g. 4 l. 21 q. 6
c. 15 h. 10 m. 19 r. [illegible]
d. 1 i. 5 n. 12 s. 20
e. 16 j. 8 o. 13 t. 9

2. a. Input device
b. CPU
c. Control unit*
d. Main memory*
e. Arithmetic/logic unit*
f. Output device

*(NOTE: These components are interchangeable.)

3. a. M g. A
b. A h. C
c. C i. M
d. C j. C
e. M k. M
f. C

4. a. 4
b. 5
c. 1
d. 2
e. 3

5. a. 2 d. 5
b. 4 e. 3
c. 6 f. 1

6. a. 4
b. 2
c. 3
d. 1

7. Evaluated to the satisfaction of the instructor

8. Evaluated to the satisfaction of the instructor

9. Evaluated to the satisfaction of the instructor

DATA REPRESENTATION/NUMBER SYSTEMS
UNIT IV

UNIT OBJECTIVE

After completion of this unit, the student should be able to match terms associated with data representation/number systems with the correct definitions and select true statements concerning the binary, octal, and hexadecimal number systems. The student should also be able to convert binary, octal, and hexadecimal numbers and complete a crossword puzzle concerning data representation and number systems. This knowledge will be evidenced by correctly performing the procedures outlined in the assignment sheets and by scoring 85 percent on the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms associated with data representation/number systems with the correct definitions.
2. Select true statements concerning the binary number system.
3. Select true statements concerning the octal number system.
4. Select true statements concerning the hexadecimal number system.
5. Match types of data codes with their descriptions.
6. Demonstrate the ability to:
    a. Convert binary numbers to decimal numbers and decimal numbers to binary numbers.
    b. Convert octal numbers to binary and decimal numbers and binary and decimal numbers to octal numbers.
    c. Convert hexadecimal numbers to binary and decimal numbers and binary and decimal numbers to hexadecimal numbers.
    d. Complete a crossword puzzle concerning data representation and number systems.

DATA REPRESENTATION/NUMBER SYSTEMS
UNIT IV

SUGGESTED ACTIVITIES

I. Provide student with objective sheet.

II. Provide student with information and assignment sheets.

III. Make transparencies.

IV. Discuss unit and specific objectives.

V. Discuss information and assignment sheets.

VI. Have students code their name and address.

VII. Teach the base 10 system.

VIII. Give test.

INSTRUCTIONAL MATERIALS

I. Included in this unit:

   A. Objective sheet

   B. Information sheet

   C. Transparency masters

      1. TM 1--Binary Tables

      2. TM 2--Octal Equivalents for Decimal Numbers 1-16

      3. TM 3--Hexadecimal Equivalents for Decimal Numbers 1-21

      4. TM 4--Hollerith Punched Card

      5. TM 5--4-Bit and 6-Bit BCD Codes

      6. TM 6--EBCDIC and ASCII Codes

   D. Assignment sheets

      1. Assignment Sheet #1--Convert Binary Numbers to Decimal Numbers and Decimal Numbers to Binary Numbers

      2. Assignment Sheet #2--Convert Octal Numbers to Binary and Decimal Numbers and Binary and Decimal Numbers to Octal Numbers

3. Assignment Sheet #3--Convert Hexadecimal Numbers to Binary and Decimal Numbers and Binary and Decimal Numbers to Hexadecimal Numbers
4. Assignment Sheet #4--Complete a Crossword Puzzle Concerning Data Representation and Number Systems

E. Answers to assignment sheets

F. Test

G. Answers to test

II. References:

A. Couger, J. Daniel and Fred McFadden. *A First Course in Data Processing.* New York: John Wiley and Sons, 1977.

B. Shelly, Gary B., and Thomas J. Cashman. *Introduction to Computers and Data Processing.* Fullerton, CA: Anaheim Publishing Co., 1980.

C. Bohl, Marilyn. *Information Processing.* Third Edition. Chicago: Science Research Associates, Inc., 1980.

D. Orilia, Lawrence. *Introduction to Business Data Processing.* New York: McGraw-Hill Book Company, 1979.

DATA REPRESENTATION/NUMBER SYSTEMS
UNIT IV

INFORMATION SHEET

I. Terms and definitions

A. Binary number system--A numeration system using the digits 0 and 1 and having a base of 2

B. Octal number system--A numeration system using the digits 0, 1, 2, 3, 4, 5, 6, and 7 and having a base of 8

C. Hexadecimal number system--A numeration system using the symbols 0 through 9 and A, B, C, D, E, and F and having a base of 16

D. Hollerith code--A code widely used for representing data on an 80-column punched card

E. Binary Coded Decimal (BCD)--A bit-pattern code used to represent data

Example: 4-bit BCD or 6-bit BCD

F. Bit (binary digit)--The smallest unit of information that can be recognized by a computer

G. Extended Binary Coded Decimal Interchange Code (EBCDIC)--An 8-bit code for character representation

H. American Standard Code for Information Interchange (ASCII)--A seven-bit code adopted as a standard to facilitate interchange of data between various machines and systems in teleprocessing environments

I. Check bit (parity bit)--A binary digit included in a pattern of bits to make the sum of all the 1 bits in the pattern either even or odd

J. Byte--A storage unit of primary storage that normally represents and stores exactly one character of data and is normally composed of 8 bits

K. Telecommunications--Transmission of information over long distances by telegraph, radio, or other electromagnetic means

L. Teleprocessing system (data communication system)--A system in which data is collected at one or more points of origin, transmitted to a central location, and processed to produce results that are distributed to one or more points of use

II. Binary number system

A. "0" and "1" are the only digits used

B. Uses a base of 2 to establish the place value for each digit

INFORMATION SHEET

C. Each place position is assigned values of one, two, four, eight

D. Place value established by raising the base of 2 to the next highest power for each place position moved to the left (Tables 1 and 2 and Transparency 1)

(NOTE: Any number to the 0 power equals 1.)

Example: Table 1 represents place values for the first four positions in the binary number system and the decimal numbers 1 and 2 are represented in the binary number system

NUMBER 1 =	0 EIGHT 2^3	0 FOUR 2^2	0 TWO 2^1	1 ONE 2^0	 Place Value Base
NUMBER 2 =	0 EIGHT 2^3	0 FOUR 2^2	1 TWO 2^1	0 ONE 2^0	 Place Value Base

Table 1

Binary Equivalents for decimal numbers 0-9

Decimal Digit	Place Value				Binary Equivalent
	8	4	2	1	
0	0	0	0	0	0000
1	0	0	0	1	0001
2	0	0	1	0	0010
3	0	0	1	1	0011
4	0	1	0	0	0100
5	0	1	0	1	0101
6	0	1	1	0	0110
7	0	1	1	1	0111
8	1	0	0	0	1000
9	1	0	0	1	1001

Table 2

III. Octal number system

A. Digits 0, 1, 2, 3, 4, 5, 6, and 7 are used

B. Uses a base of 8 to establish the place value for each digit

C. Place value established by raising the base of 8 to the next highest power for each place position moved to the left

INFORMATION SHEET

D. Largest decimal number that can be represented by a single digit is the value 7 (Table 3 and Transparency 2)

(NOTE: The decimal number 8 is represented in octal by the value one zero.)

Example: Octal equivalents for decimal numbers 1 through 16 are represented in Table 3

Octal Equivalents for decimal numbers 1 - 16

DECIMAL	OCTAL
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	10
9	11
10	12
11	13
12	14
13	15
14	16
15	17
16	20

Table 3

INFORMATION SHEET

IV. Hexadecimal number system

A. Digits 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, and F are used (Table 4 and Transparency 3)

B. Uses a base of 16 to establish the place value for each digit

C. Place value established by raising the base of 16 to the next highest power for each place position moved to the left

D. Representation of the digits 0-9 are the same in the hexadecimal number system as in the decimal number system; to represent decimal values 10-15, the hexadecimal system uses the letters of the alphabet A-F

Hexadecimal equivalents for decimal numbers 1 through 21

DECIMAL VALUE	HEXADECIMAL NOTATION
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	A
11	B
12	C
13	D
14	E
15	F
16	10
17	11
18	12
19	13
20	14
21	15

Table 4

INFORMATION SHEET

V. Data codes

A. Hollerith code (Transparency 4)

1. Represents numbers, letters, and special characters encoded on an 80-column punched card
2. Characters represented by one or more punches in a single column of a card
3. Punched card contains ten rows numbered 0 through 9, and two zone rows numbered 11 and 12; the top row numbered 0 can be used for the numeric 0 and some alphabetic and special characters
4. Digits 0 through 9 represented by a single punch in a corresponding row (zones not used) and letters and special characters represented by a combination of zones and/or numeric punches
5. Input from Hollerith code is converted to one of the following codes: 4-bit BCD, 6-bit BCD, EBCDIC, or ASCII

B. 4-Bit Binary Coded Decimal (BCD) (Transparency 5)

1. Represented by a set of four bits

   Example: BCD code for decimal number 437

2. Only numeric or special data may be represented
3. Only 16 numeric or 24 characters can be represented

C. 6-Bit Binary Coded Decimal (BCD) (Transparency 5)

1. Adds two additional bits (called zone bits) to the four numeric bits in the 4-bit BCD
2. Represented by a set of six bits
3. Sixty-four characters may be represented: 10 decimal digits, 26 alphabetic characters, and up to 28 special characters
4. Decimal numbers are represented by appropriate numeric bit combinations and the zone bits are set to 0
5. Alphabetical and special characters are represented by a combination of zone and numeric bits
6. A seventh bit (check bit) is added for checking purposes

INFORMATION SHEET

D. Extended Binary Coded Decimal Interchange Code (EBCDIC) (Transparency 6)

1. Uses 8 bits in combination to store a letter of the alphabet, a number, or a special character
2. Two hundred fifty-six characters or 28 are represented
3. Eight bits together in EBCDIC are called a byte
4. Each byte is divided into two portions, the zone portion and the digit portion
5. Numeric values are represented in the EBCDIC with all of the zone bits "on" and the proper combination of bits in the digit portion of the byte "on" to represent the particular numeric value
6. Each decimal digit is stored in a single byte when using EBCDIC
7. Alphabetic data is represented in the EBCDIC with a combination of bits "on" and "off" and include both upper and lower case

E. American Standard Code for Information Interchange (ASCII) (Transparency 6)

1. Seven-bit code developed by and for users of telecommunications and data processing (teleprocessing) networks
2. Computers produced by different manufacturers may be linked together in a data processing communication system with the use of this code
3. Similar to the EBCDIC in that it uses a zone and digit configuration, but the zone and digit bits are different

Binary Tables

Number 1 =	0	0	0	1	
	Eight	Four	Two	One	Place Value
	2^3	2^2	2^1	2^0	Base
Number 2 =	0	0	1	0	
	Eight	Four	Two	One	Place Value
	2^3	2^2	2^1	2^0	Base

Table 1

Decimal Digit	Place Value				Binary Equivalent
	8	4	2	1	
0	0	0	0	0	0000
1	0	0	0	1	0001
2	0	0	1	0	0010
3	0	0	1	1	0011
4	0	1	0	0	0100
5	0	1	0	1	0101
6	0	1	1	0	0110
7	0	1	1	1	0111
8	1	0	0	0	1000
9	1	0	0	1	1001

Table 2

Octal Equivalents for Decimal Numbers 1-16

Decimal	Octal
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	10
9	11
10	12
11	13
12	14
13	15
14	16
15	17
16	20

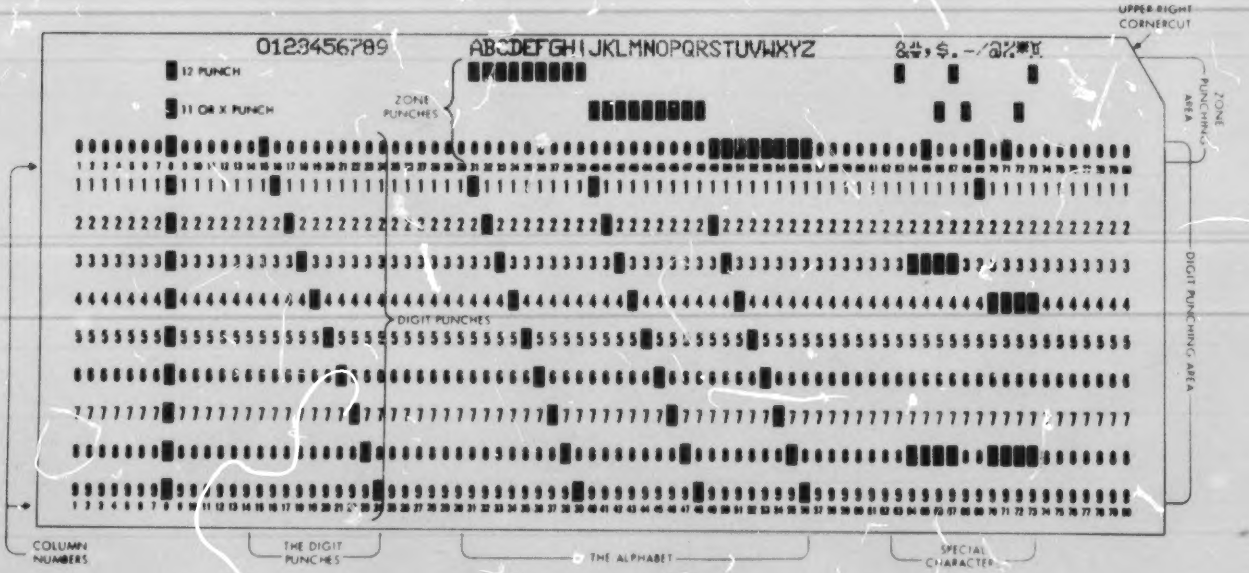
Table 3

Hexadecimal Equivalents for Decimal Numbers 1-21

Decimal Value	Hexadecimal Notation
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	A
11	B
12	C
13	D
14	E
15	F
16	10
17	11
18	12
19	13
20	14
21	15

Table 4

Hollerith Punched Card


0123456789
ABCDEFGHIJKLMNOPQRSTUVWXYZ
&#,$.-/@%*¤
UPPER RIGHT CORNERCUT
12 PUNCH
11 OR X PUNCH
ZONE PUNCHES
ZONE PUNCHING AREA
DIGIT PUNCHES
DIGIT PUNCHING AREA
COLUMN NUMBERS
THE DIGIT PUNCHES
THE ALPHABET
SPECIAL CHARACTER

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4-Bit and 6-Bit BCD Codes

4	3	7	Decimal
0100	0011	0111	4-Bit BCD

4-Bit BCD Code for Decimal Number 437

BCD Position							
C	B	A	8	4	2	1	Character
1	0	0	0	0	1	1	3
0	1	1	0	0	0	1	A

6-Bit BCD Code for Decimal
3 and Character A

EBCDIC and ASCII Codes

Bit Positions in EBCDIC								
Zone Bits				Numeric Bits				Character
1	1	1	1	0	1	0	1	5
1	1	0	0	0	0	0	1	A
0	1	0	1	1	0	1	1	$

EBCDIC Code for Characters 5,A,$

Bit Positions in ASCII							
Zone			Numeric				Character
0	1	1	0	1	0	1	5
1	0	0	0	0	0	1	A

ASCII Code for Characters 5 and A

DATA REPRESENTATION/NUMBER SYSTEMS
UNIT IV

ASSIGNMENT SHEET #1--CONVERT BINARY NUMBERS TO DECIMAL NUMBERS AND DECIMAL NUMBERS TO BINARY NUMBERS

A. Conversion from binary to decimal

1. Position values in the numeral are based on the right-to-left progression of powers of 2 (2^0, 2^1, 2^2, 2^3, etc.)

2. The rightmost position has a value of 1; the next position, a value of 2; the next, 4; the next, 8; the next, 16; etc. (Table 1)

2^{14}	2^{13}	2^{12}	2^{11}	2^{10}	2^9	2^8	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
16284	8192	4096	2048	1024	512	256	128	64	32	16	8	4	2	1

Place Values of Binary Numerals
Table 1

(NOTE: The conversion of binary numbers to decimal numbers is called expanded notation.)

3. Position values of the original numeral are written out and then added

Example: The conversion of 100110 to its decimal equivalent is 38

$$100110 = (1 \times 2^5) + (0 \times 2^4) + (0 \times 2^3) + (1 \times 2^2) + (1 \times 2^1) + (0 \times 2^0)$$

$$= 32 + 0 + 0 + 4 + 2 + 0$$

$$= 38 \text{ (decimal)}$$

4. Write the decimal numerals equivalent to the following binary numerals.

a. 1101 ______________________

b. 100110 ______________________

c. 0101101 ______________________

d. 110011000 ______________________

B. Conversion from decimal to binary

(NOTE: Conversion from decimal numbers to binary numbers is called the division-multiplication method.)

1. Divide the number repeated by the value of 2

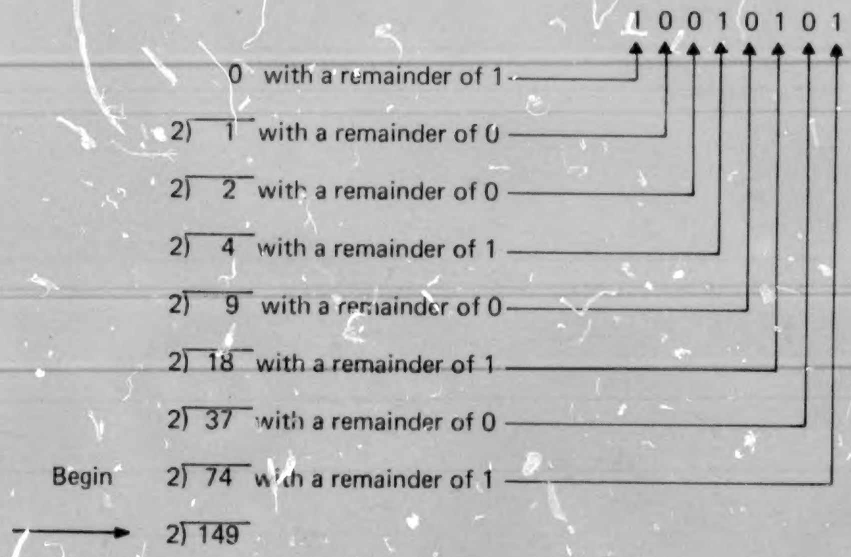
(NOTE: This method is similar to other base systems: simply divide the number to be converted by the value of the base to which the number is being converted.)

ASSIGNMENT SHEET #1

2. The division operation is repeated until the quotient is 0

3. The remainders are written in reverse of the order in which they were obtained and form the binary number

   Example: The conversion of decimal numeral 149 to its binary equivalent is 10010101



1 0 0 1 0 1 0 1

0 with a remainder of 1

2) 1 with a remainder of 0

2) 2 with a remainder of 0

2) 4 with a remainder of 1

2) 9 with a remainder of 0

2) 18 with a remainder of 1

2) 37 with a remainder of 0

Begin 2) 74 with a remainder of 1

→ 2) 149

4. Write, in the blank following each decimal, the equivalent binary numeral.

   a. 7__________________

   b. 16__________________

   c. 43__________________

   d. 62__________________

DATA REPRESENTATION/NUMBER SYSTEMS
UNIT IV

ASSIGNMENT SHEET #2--CONVERT OCTAL NUMBERS TO BINARY AND DECIMAL NUMBERS AND BINARY AND DECIMAL NUMBERS TO OCTAL NUMBERS

A. Conversion from binary to octal

1. Write binary number on sheet of paper
2. Begin at right-most digit and mark off groups of three bits, continuing until you reach the left-most bit position

   (NOTE: Each group uses the value of 2 to the 2nd, 1st, and 0 powers.)

3. Write down the decimal equivalent of each group of three binary digits

   Example: Octal equivalent of binary number 010011101

Sum of place values	2 =	3 =	5 =
Value of 2 raised to 2nd, 1st, and 0 power	0 + 2 + 0	0 + 2 + 1	4 + 0 + 1
Place value	2^2 2^1 2^0	2^2 2^1 2^0	2^2 2^2 2^0
Binary number	0 1 0	0 1 1	1 0 1
Octal equivalent no.	2	3	5

B. Conversion from octal to binary

1. Any one octal digit represents three binary digits
2. Write the equivalent binary digits under each octal digit

   Example: Octal number 235 is expressed as 010011101 in binary

$$\begin{array}{ccc} 2 & 3 & 5 \\ \wedge & \wedge & \wedge \\ 010 & 011 & 101 \end{array} \qquad \text{or } 235 \text{ (octal)} = 010011101 \text{ (binary)}$$

C. Conversion from octal to decimal

1. May use same technique used for converting binary to decimal
2. Position values of the original numeral are written out and then added

   Example: The conversion of the octal number to its decimal equivalent is 459

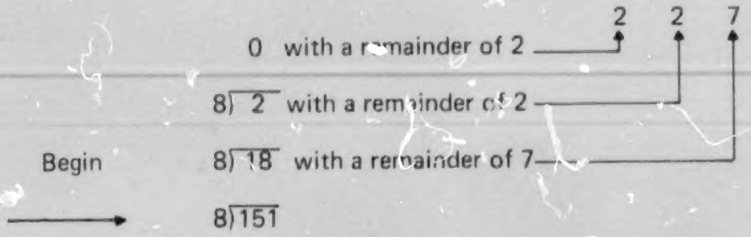
$$\begin{aligned} 713 &= (7 \times 8^2) + (1 \times 8^1) + (3 \times 8^0) \\ &= 488 \quad + \quad 8 \quad + \quad 3 \\ &= 459 \text{ (decimal)} \end{aligned}$$

ASSIGNMENT SHEET #2

D. Conversion from decimal to octal

1. Use same technique used for converting decimal-to-binary
2. Number is repeatedly divided by the value 8

Example: The conversion of decimal numeral 151 to octal equivalent is 227


2 2 7
0 with a remainder of 2
8)2 with a remainder of 2
Begin
8)18 with a remainder of 7
8)151

E. Convert the following numbers as indicated.

1. 010011 binary = ______________________ octal
2. 011110101 binary = ______________________ octal
3. 235 octal = ______________________ binary
4. 23 octal = ______________________ binary
5. 714 octal = ______________________ decimal
6. 559 decimal = ______________________ octal

DATA REPRESENTATION/NUMBER SYSTEMS
UNIT IV

ASSIGNMENT SHEET #3--CONVERT HEXADECIMAL NUMBERS TO BINARY AND DECIMAL NUMBERS AND BINARY AND DECIMAL NUMBERS TO HEXADECIMAL NUMBERS

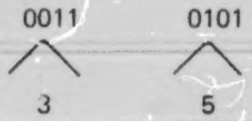
A. Conversion of binary to hexadecimal

1. Similar to conversion of binary to octal

2. Group binary numbers in fours beginning at the right-most number, and continuing until the left-most number is reached

3. Write down the decimal equivalent of each group of four binary digits

Example: Hexadecimal equivalent of binary number 00110101



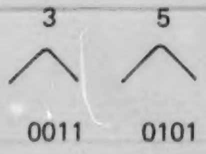
or 00110101 (binary) = 35 (hexadecimal)

B. Conversion of hexadecimal to binary

1. Any one hexadecimal digit represents four binary digits

2. Write the equivalent binary digits under each hexadecimal digit

Example: Hexadecimal number 35 is expressed as 00110101



or 35 (hexadecimal) = 0110101 (binary)

C. Conversion of hexadecimal to decimal

1. May use same technique used for converting binary to decimal

2. Position values of the original numeral are written out and then added

Example: The conversion of A5 to its decimal equivalent is 165

$$A5 = (10 \times 16^1) + (5 \times 16^0)$$
$$= 160 + 5$$
$$= 165 \text{ (decimal)}$$

ASSIGNMENT SHEET #3

D. Conversion of decimal to hexadecimal

1. Use same technique used for converting decimal to binary
2. Number is repeatedly divided by the value 16

Example: The conversion of decimal numeral 1710 to hexadecimal numeral is 6AE

6 A E

0 with a remainder of 6

16) 6 with a remainder of 10

Begin 16) 106 with a remainder of 14

→ 16) 1710

E. Assume that the following hexadecimal numerals appear on a printout of the contents of the storage unit of a computer. For each numeral, show the binary digits that are stored in the computer.

1. FF15A903________________________

2. 75C4D831________________________

F. Write, in the blank following each decimal numeral, the hexadecimal numeral that is equivalent to it.

1. 8________________________

2. 12________________________

3. 432________________________

4. 1698________________________

DATA REPRESENTATION/NUMBER SYSTEMS
UNIT IV

ASSIGNMENT SHEET #4--COMPLETE A CROSSWORD PUZZLE CONCERNING DATA REPRESENTATION AND NUMBER SYSTEMS

Directions: Complete the following crossword puzzle on the next page by supplying the term associated with data representation/number systems that corresponds with the definition given.

ACROSS

1. A code widely used for representing data on an 80-column punched card (2 words)
2. A numeration system using the digits 0 and 1 and having a base of 2 (3 words)
3. A system in which data is collected at one or more points of origin, transmitted to a central location, and processed to produce results that are distributed to one or more points of use
6. A seven-bit code adopted as a standard to facilitate interchange of data between various machines and systems in teleprocessing environments

   (NOTE: Initials are used for this answer.)
7. The smallest unit of information that can be recognized by a computer
9. A bit-pattern code used to represent data

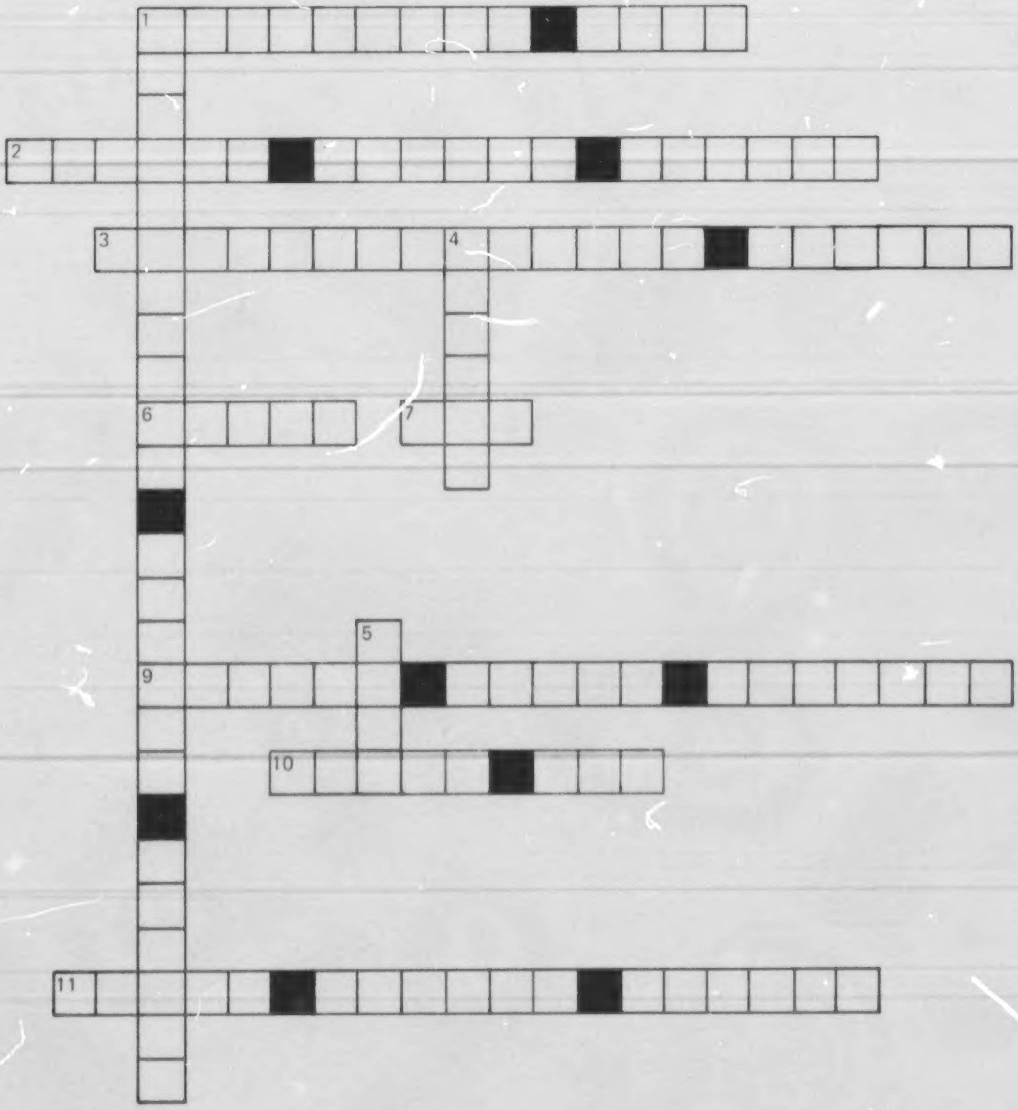
   Example: 4-bit BCD or 6-bit BCD (3 words)
10. A binary digit included in a pattern of bits to make the sum of all the 1 bits in the pattern either even or odd (2 words)
11. A numeration system using the digits 0, 1, 2, 3, 4, 5, 6, 7 and having a base of 8 (3 words)

DOWN

1. A numeration system using the symbols 0 through 9 and A, B, C, D, E, and F and having a base of 16 (3 words)
4. An 8-bit code for character representation

   (NOTE: Initials are used for this answer.)
5. A storage unit of primary storage that normally represents and stores exactly one character of data and is composed of 8 bits

ASSIGNMENT SHEET #4


1
2
3
4
5
6
7
9
10
11

DATA REPRESENTATION/NUMBER SYSTEMS
UNIT IV

ANSWERS TO ASSIGNMENT SHEETS

Assignment Sheet #1

A. 4. a. $1101 = (1 \times 2^3) + (1 \times 2^2) + (0 \times 2^1) + (1 \times 2^0)$

$= 8 + 4 + 0 + 1$

$= 13$

b. $100110 = (1 \times 2^5) + (0 \times 2^4) + (0 \times 2^3) + (1 \times 2^2) + (1 \times 2^1) + (0 \times 2^0)$

$= 32 + 0 + 0 + 4 + 2 + 0$

$= 38$

c. $0101101 = (0 \times 2^6) + (1 \times 2^5) + (0 \times 2^4) + (1 \times 2^3) + (1 \times 2^2) + (0 \times 2^1) + (1 \times 2^0)$

$= 0 + 32 + 0 + 8 + 4 + 0 + 1$

$= 45$

d. $110011000 = (1 \times 2^8) + (1 \times 2^7) + (0 \times 2^6) + (0 \times 2^5) + (1 \times 2^4) + (1 \times 2^3) +$

$(0 \times 2^2) + (0 \times 2^1) + (0 \times 2^0)$

$= 256 + 128 + 0 + 0 + 16 + 8 +$

$0 + 0 + 0$

$= 408$

B. 4. a. 7 = 1 1 1

0 remainder 1
2) 1 remainder 1
2) 3 remainder 1
2) 7

b. 16 = 1 0 0 0 0

0 remainder 1
2) 2 remainder 0
2) 4 remainder 0
2) 8 remainder 0
2) 16 remainder 0

c. 43 = 1 0 1 0 1 1

0 remainder 1
2) 1 remainder 0
2) 2 remainder 1
2) 5 remainder 0
2) 10 remainder 1
2) 21 remainder 1
2) 43

d. 62 = 1 1 1 1 1 0

0 remainder 1
2) 1 remainder 1
2) 3 remainder 1
2) 7 remainder 1
2) 15 remainder 1
2) 31 remainder 0
2) 62

Assignment Sheet #2

E. 1. 23
2. 365
3. 010011101
4. 010011
5. 460
6. 1057

Assignment Sheet #3

E. 1. 1111 1111 0001 0101 1010 1001 0000 0011
2. 0111 0101 1100 0100 1101 1110 0011 0001

F. 1. 8
2. C
3. 1BO
4. 6A2

Assignment Sheet #4

ACROSS

1. Hollerith Code
2. Binary Number System
3. Teleprocessing System
6. ASCII
7. Bit
9. Binary Coded Decimal
10. Check Bit
11. Octal Number System

DOWN

1. Hexadecimal Number System
4. EBCDIC
5. Byte

DATA REPRESENTATION/NUMBER SYSTEMS
UNIT IV

NAME ________________________________

TEST

1. Match the terms on the right with the correct definitions.

______a. A binary digit included in a pattern of bits to make the sum of all the 1 bits in the pattern either even or odd

______b. The smallest unit of information that can be recognized by a computer

______c. A system in which data is collected at one or more points of origin, transmitted to a central location, and processed to produce results that are distributed to one or more points of use

______d. Transmission of information over long distances by telegraph, radio, or other electromagnetic means

______e. An 8-bit code for character representation

______f. A numeration system using the symbols 0 through 9 and A, B, C, D, E, and F and having a base of 16

______g. A bit-pattern code used to represent data

______h. A storage unit of primary storage that normally represents and stores exactly one character of data and is normally composed of 8 bits

______i. A numeration system using the digits 0 and 1 and having a base of 2

______j. A code widely used for representing data on an 80-column punched card

______k. A numeration system using the digits 0, 1, 2, 3, 4, 5, 6, 7 and having a base of 8

______l. A seven-bit code adopted as a standard to facilitate interchange of data between various machines and systems in teleprocessing environments

1. American Standard Code for Information Interchange
2. Binary Coded Decimal
3. Binary number system
4. Bit
5. Byte
6. Check bit
7. Extended Binary Coded Decimal Interchange Code
8. Hexadecimal number system
9. Hollerith code
10. Octal number system
11. Telecommunications
12. Teleprocessing system

2. Select true statements concerning the binary number system by placing an "X" in the appropriate blanks.

_____ a. "0" and "1" are the only digits used

_____ b. Uses a base of 1 to establish the place value for each digit

_____ c. Each place position is assigned values of two, four, six, eight

_____ d. Place value established by raising the base of 2 to the next highest power for each place position moved to the left

3. Select true statements concerning the octal number system by placing an "X" in the appropriate blanks.

_____ a. Digits 0, 1, 2, 3, 4, 5, 6, 7 and 8 are used

_____ b. Uses a base of 8 to establish the place value for each digit

_____ c. Place value established by raising the base of 8 to the next highest power for each place position moved to the left

_____ d. Largest decimal number that can be represented by a single digit is the value 10

4. Select true statements concerning the hexadecimal number system by placing an "X" in the appropriate blanks.

_____ a. Digits 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E and F are used

_____ b. Uses a base of 16 to establish the place value for each digit

_____ c. Place value established by raising the base of 10 to the 16th power for each consecutive place position

_____ d. Decimal values 10-15 in the hexadecimal system use the letters of the alphabet A-F

5. Match the types of data codes on the right with their descriptions.

(NOTE: Answers may be used more than once.)

_____ a. Adds two additional bits to the four numeric bits in the 4-bit BCD

_____ b. Seven-bit code developed by and for users of telecommunications and data processing networks

_____ c. Represents numbers, letters, and special characters encoded on an 80-column punched card

_____ d. Only 16 numeric or 24 characters can be represented

1. 6-Bit Binary Coded Decimal
2. American Standard Code for Information Interchange
3. Hollerith code
4. Extended Binary Coded Decimal Interchange Code
5. 4-Bit Binary Coded Decimal

______e. Uses 8 bits in combination to store a letter of the alphabet, a number, or a special character

_______f. Computers produced by different manufacturers may be linked together in a data processing communication system with the use of this code

______g. Sixty-four characters may be represented: 10 decimal digits, 26 alphabetic characters, and up to 28 special characters

______h. Characters represented by one or more punches in a single column of a card

______i. Only numeric or special data may be represented

______j. Two hundred fifty-six characters or 28 are represented

______k. Each decimal digit is stored in a single byte when using this code

6. Demonstrate the ability to:

   a. Convert binary numbers to decimal numbers and decimal numbers to binary numbers

   b. Convert octal numbers to binary and decimal numbers and binary and decimal numbers to octal numbers

   c. Convert hexadecimal numbers to binary and decimal numbers and binary and decimal numbers to hexadecimal numbers

   d. Complete a crossword puzzle concerning data representation and number systems

   (NOTE: If these activities have not been accomplished prior to the test, ask your instructor when they should be completed.)

DATA REPRESENTATION/NUMBER SYSTEMS
UNIT IV

ANSWERS TO TEST

1. a. 6
   b. 4
   c. 12
   d. 11
   e. 7
   f. 8
   g. 2
   h. 5
   i. 3
   j. 9
   k. 10
   l. 1

2. a, d

3. b, c

4. a, b, d

5. a. 1
   b. 2
   c. 3
   d. 5
   e. 4
   f. 2
   g. 1
   h. 3
   i. 5
   j. 4
   k. 4

6. Evaluated to the satisfaction of the instructor

INPUT/OUTPUT DEVICES AND THEIR MEDIA
UNIT V

UNIT OBJECTIVE

After completion of this unit, the student should be able to match the types of paper media with their characteristics, and match the types of magnetic media and keyboard devices with their characteristics. The student should also be able to locate optical reading characters and dictate and transcribe information. This knowledge will be evidenced by correctly performing the procedures outlined in the assignment sheets and by scoring 85 percent on the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms related to input/output devices with the correct definitions.
2. Match types of paper media with their characteristics.
3. Select true statements concerning devices which use paper media.
4. Classify printing devices as impact or non-impact.
5. Match types of magnetic media with their characteristics.
6. Match types of keyboard devices with their characteristics.
7. Match optical reading equipment with their characteristics.
8. Select true statements concerning other input/output devices.
9. Complete a crossword puzzle on printing devices.
10. Locate optical reading characters.
11. Dictate and transcribe information.

INPUT/OUTPUT DEVICES AND THEIR MEDIA
UNIT V

SUGGESTED ACTIVITIES

I. Provide student with objective sheet.

II. Provide student with information and assignment sheets.

III. Discuss unit and specific objectives.

IV. Discuss information and assignment sheets.

V. Bring in samples of various output media.

VI. Show a letter typed first by typewriter and then by word processing equipment to provide students the different products.

VII. Have students visit department stores that display various information processing equipment.

VIII. Lead a discussion on how the U.S. Postal Service uses the OCR code.

IX. If these materials are being used in a word processing program, practice dictation exercises.

X. If equipment is available, the students should begin working with input/output statements.

XI. Give test.

INSTRUCTIONAL MATERIALS

I. Included in this unit:

- A. Objective sheet
- B. Information sheet
- C. Assignment sheets
    1. Assignment Sheet #1--Complete A Crossword Puzzle on Printing Devices
    2. Assignment Sheet #2--Locate Optical Reading Characters
    3. Assignment Sheet #3--Dictate and Transcribe Information
- D. Answers to assignment sheets
- E. Test
- F. Answers to test

II. References:

A. Cougar, J. Daniel, and Fred McFadden. *A First Course in Data Processing.* New York: John Wiley and Sons, 1977.

B. Orilia, Lawrence S. *Introduction to Business Data Processing.* New York: McGraw-Hill Book Company, 1979.

C. Bohl, Marilyn. *Information Processing.* Third Edition. Chicago: Science Research Associates, 1980.

D. Bergerud, Marly and Jean Gonzalez. *Word Processing Concepts and Careers.* New York: John Wiley and Sons, 1978.

E. Wanous, S. J., Gerald Wagner, and Stephen F. Hallam. *Introduction to Automated Data Processing.* Second Edition. Dallas: South-Western Publishing Company, 1979.

F. Robichaud, Beryl, Eugene Muscat, and Alix-Marie Hill. *Introduction to Data Processing.* New York: Gregg Division/McGraw-Hill Publishing Co., 1977.

G. Popkin, Gary S. and Arthur H. Pike. *Introduction to Data Processing.* Boston: Houghton Mifflin Publishing Co., 1976.

H. Silver, Gerald A. *Small Computer Systems for Business.* St. Louis: McGraw-Hill Publishing Co., 1978.

I. Casady, Mona. *Word Processing Concepts.* Dallas: South-Western Publishing Co., 1980.

INPUT/OUTPUT DEVICES AND THEIR MEDIA
UNIT V

INFORMATION SHEET

I. Terms and definitions

A. Input/output devices–Device mechanisms for reading in data to be processed and for reporting results

(NOTE: This is also referred to as I/O.)

B. Punched card–A storage medium in which data is represented by means of holes punched in vertical columns in a paper card

C. Hollerith code--The computer code employed with the 80-column card, composed of punches made in the 12 rows of the card

D. Impact printer--Physically strikes paper surface leaving character images on paper similar to a typewriter

(NOTE: The impact printer can make duplicate copies.)

E. Non-impact printer--Forms characters by either transferring electrical charges or by making thermal imprints on the paper

(NOTE: The non-impact printer makes one copy at a time.)

F. Magnetic tape--Medium on which data is recorded in the form of magnetized spots on the surface of magnetically sensitive coated tape

G. Magnetic disk--Thin metal disk coated on each side so that data can be recorded in the form of magnetized spots

H. Direct access--Feature of magnetic media which makes it possible to find information instantly on the medium without regard to the sequence

I. Cathode ray tube (CRT)--A vacuum tube with a screen and a controlled beam of electrons that may be used as a display or a storage device

J. Direct access storage--File storage where any record can be accessed without the need to access all preceding records

K. Sequential access--Data retrieved from a file, one record after another in a pre-determined sequence

L. Facsimile--The process of transmitting textual and illustrative copy electronically

(NOTE: This process is sometimes transmitted by radio, but more typically by telephone in office operations. Documents scanned on a rotating drum at the sending site are recreated on a comparable drum at the receiving site.)

INFORMATION SHEET

M. Point-of-sale automation--A system in which retail goods are labeled with machine-readable symbols (using the Universal Price Code) and in which cashier checkout stations are equipped with devices for reading these labels

(NOTE: This provides for automatic pricing of purchases and for the collection of inventory data.)

II. Types of paper media and their characteristics (Transparency 1)

A. Punched card (Figure 1)

1. 80-column card

a. Measures 3 1/4" x 7 3/8"

b. Uses the Hollerith code

c. Records data in the form of punched holes

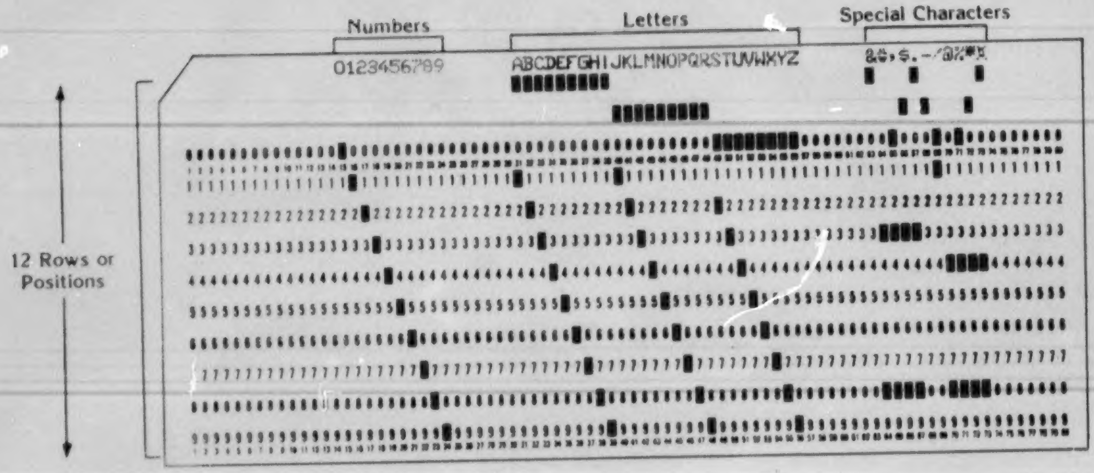

Numbers
Letters
Special Characters
0123456789
ABCDEFGHIJKLMNOPQRSTUVWXYZ
12 Rows or Positions

FIGURE 1 The 80-Column Card

INFORMATION SHEET

2. 96-column card (Figure 2)
    a. Measures 3 1/4" x 2 5/8"
    b. Is one-third the size of an 80-column card
    c. Uses the BCD code

       (NOTE: The BCD is an abbreviation for binary coded decimal code.)
    d. Stores 20% more information than the 80-column card

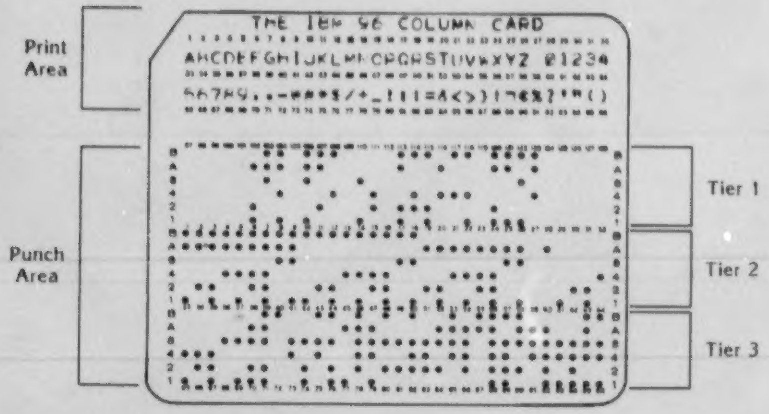


FIGURE 2 — The 96-Column Card

3. Advantages
    a. Fewer devices used
    b. Easy to understand and use
4. Disadvantages
    a. Storing and handling problem
    b. Slow form of processing
    c. Cannot be reused

B. Paper tape

1. A continuous paper tape recording medium, containing rows of punched holes that represent a code for letters, digits, and symbols
2. Data is recorded in channels, similar to magnetic tape

INFORMATION SHEET

3. Advantages
    a. Low cost
    b. Data not limited to 80 columns
    c. Cannot be erased accidentally
    d. Less vulnerable to variations of moisture and temperature
4. Disadvantages
    a. Less efficient to correct
    b. Cannot be sorted
    c. Not reusable for new data

III. Devices which use paper media

A. Card reader (Figure 3)

1. Designed to recognize holes punched in a card and transmit information in an electronic form to the computer
2. Types
    a. Brush-type--Detects the presence or absence of holes by passing the cards under brush-type rollers; the holes are then converted into electrical impulses
    b. Photoelectric--Detects the presence or absence of holes by passing the cards over a photoelectric light which converts the holes into electrical impulses

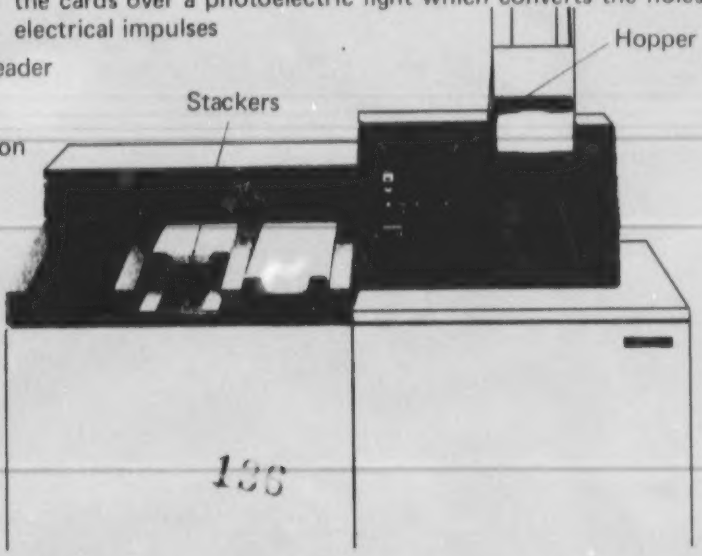


FIGURE 3 Card Reader

Courtesy IBM Corporation

INFORMATION SHEET

B. Card punch

1. Punches data from computer storage onto blank paper cards in certain patterns

2. Linked directly to the computer

C. Card reader/punch

1. Combines features of a card reader and a card punch

2. May read one card while another card is being punched

D. Paper tape reader (Figure 4)

1. Provides input to a computer by reading prepunched data from a paper tape

2. Moves tape past a reading unit where the presence or absence of holes in the tape is sensed and converted to electronic impulses acceptable to the computer

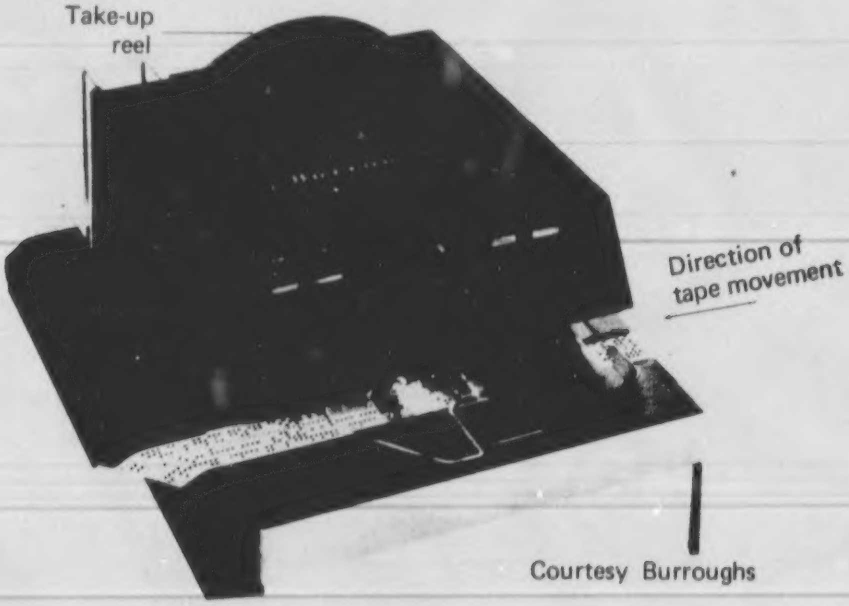


FIGURE 4
Paper Tape Reader

Courtesy Burroughs

E. Paper tape punch

1. Used to generate paper tape output

2. Provides output from computer by punching output information

3. Punches information in blank tape as the tape moves through a punching mechanism

INFORMATION SHEET

IV. Classification of printing devices

(NOTE: Different kinds of printers may print a character at a time, a line at a time, or a page at a time.)

A. Impact printer

1. Chain printer--A flexible chain of characters which rotates with the printer placing the character in front of the desired print position; 600 to 2,400 lines per minute
2. Wire-matrix printer--Represents printed data in the form of dots created by the ends of a matrix of wires which strike paper; 80 to 400 lines per minute
3. Typebar printer--A bar mounted on an impact printer that holds type slugs
4. Element--The typing component of an electric typewriter shaped in the form of a golf ball
5. Daisy print wheel--A plastic or metal printing device in the shape of a wheel which resembles a flattened daisy with each of 92 or 96 characters on the spoke of the wheel
6. Thimble printer--A plastic or metal printing device similar to a daisy printing wheel whose spokes are folded upward to resemble a thimble; contains 128 characters

B. Non-impact printers

1. Electrostatic printer--Employs a process similar to a copying machine to print data
2. Thermal printer--Heating elements which burn characters onto chemically treated paper
3. Ink jet printer--Electronically charged magnetic ink is sprayed onto the surface of paper; approximately 100 characters per second
4. Laser printer--A low-power laser creates character images that are electrostatically transferred to the paper to produce printed output
5. Plotter--A printing device capable of providing continuous line drawings and pictorial solutions to data processing problems; offers a picture not possible with conventional line printers
6. Matrix printer--A high-speed printer that prints character-like configurations of dots
7. Intelligent printer/copier--A printer which combines laser, computer, and some photocopying technology to produce printed output; input may come from magnetic cards or through telephone lines from a computer or word processor

INFORMATION SHEET

V. Characteristics of magnetic media

A. Magnetic tape

1. One of most popular media for representing information
2. Reusable
3. Main use is for storing large amounts of sequential data
4. One reel of tape holds over 20 million characters of data

   (NOTE: A reel can store the equivalent of over 100,000 cards.)

5. Stores information in the form of magnetized spots
6. Low cost

   (NOTE: A magnetic tape drive is used to process magnetic tape. See Figure 5.)

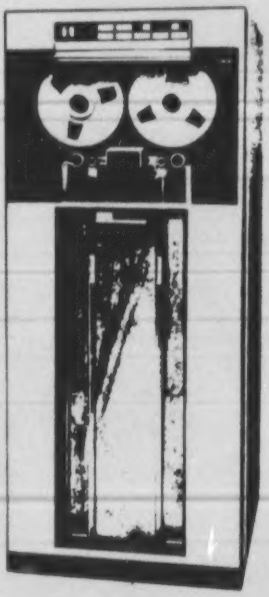


FIGURE 5

Magnetic Tape Drive

Courtesy IBM Corporation

B. Magnetic disk (Figure 6)

1. Large direct access storage capacity at a reasonable cost
2. A thin metal platter coated on both sides with a ferrous oxide material
3. Data recorded in the form of magnetized spots
4. Surface is divided into tracks and sectors

INFORMATION SHEET

5. Several disks are mounted on a spindle and enclosed in a disk module (or disk pack)

   (NOTE: Magnetic disks are processed on a magnetic disk drive.)

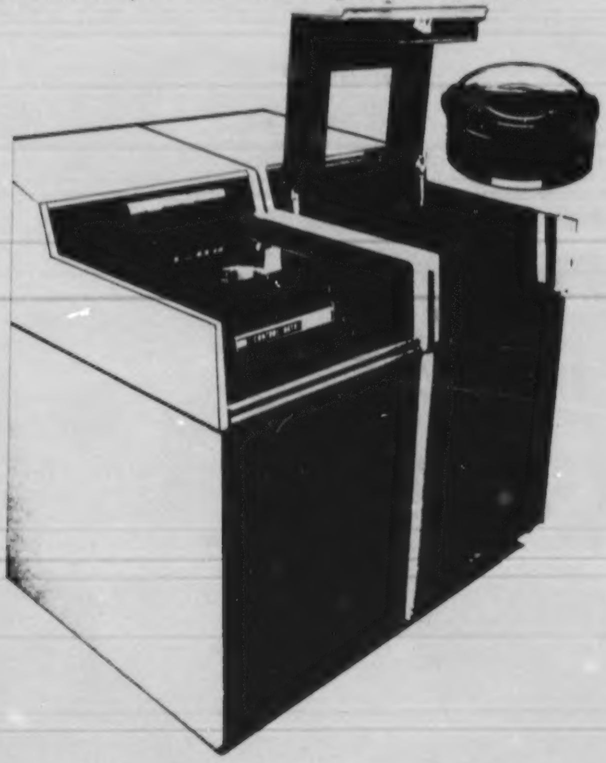


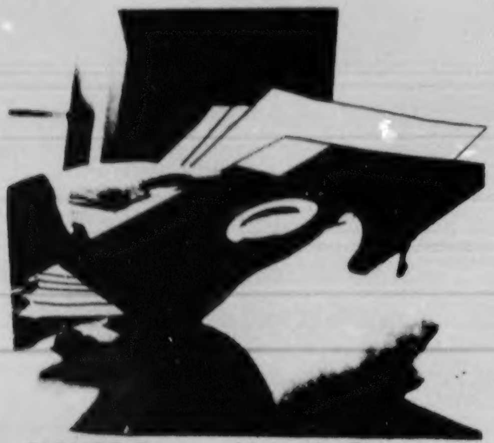
FIGURE 6 Magnetic Disk

C. Magnetic floppy disk (Figure 7)

1. Flexible, oxide-coated mylar disks stored in paper or plastic envelopes
2. Entire envelope is inserted into disk unit
3. Relatively inexpensive
4. Widely used in text-editing minicomputer and microcomputer systems

INFORMATION SHEET

5. Direct access storage capacity



Courtesy IBM Corporation

FIGURE 7 Magnetic Floppy Disk

VI. Characteristics of keyboard devices

A. Typewriter

1. Early method of recording printed output
2. Slowest method
3. Kinds
    - a. Manual
    - b. Electric
    - c. Automatic typewriter
    - d. Text-editor

B. Video display terminal (VDT)

1. Uses a cathode ray tube (CRT) for output
2. Displays up to 2000 characters
3. Provides a combination input/output piece of equipment
4. May connect a hardcopy terminal to obtain hardcopy output

(CAUTION: Original message is lost when displaced by another message.)

INFORMATION SHEET

C. Data collection device

1. Used in manufacturing plants to collect production data
2. Captures data in machine-readable form
3. Sends collected data to a central computer

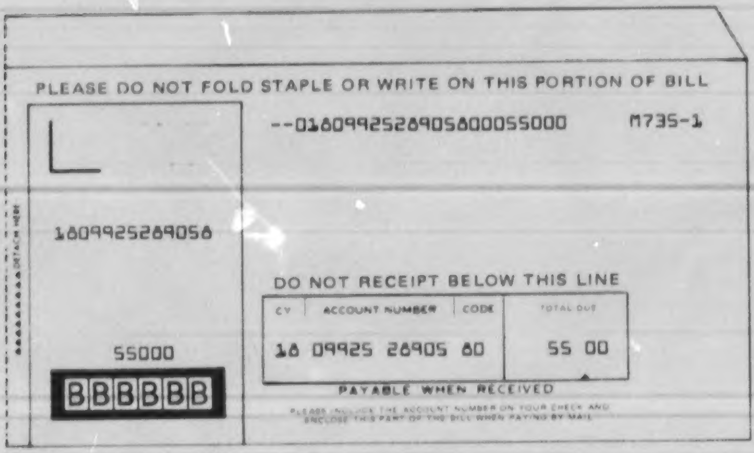
VII. Optical reading equipment

A. Optical-mark reader

1. Reads data from cards, pencils, and marks
2. Transmits data to computer and records automatically on another medium
3. Used primarily for data collection, test scores, and inventory control
4. Simplest type of optical reader available

B. Optical character recognition (OCR) (Figure 8)

1. Contains specially shaped characters
2. Identifies entire character by comparing it with similar character in memory
3. Does not require special ink



PLEASE DO NOT FOLD STAPLE OR WRITE ON THIS PORTION OF BILL

--0160992528905600055000 M735-1

1609925289056

55000

BBBBBB

DO NOT RECEIPT BELOW THIS LINE

CY	ACCOUNT NUMBER	CODE	TOTAL DUE
16	09925 28905	60	55 00

PAYABLE WHEN RECEIVED

PLEASE INCLUDE THE ACCOUNT NUMBER ON YOUR CHECK AND ENCLOSE THIS PART OF THE BILL WHEN PAYING BY MAIL

FIGURE 8 Typical Bill with OCR Characters

INFORMATION SHEET

C. Magnetic-ink character reader (MICR) (Figure 9)

1. Is in a readable form
2. Transfers off-line and on-line
3. Generally used in banks to process checks and deposits
4. Reading head magnetically senses each character
5. Must be printed in magnetic ink
6. Must be specially shaped characters

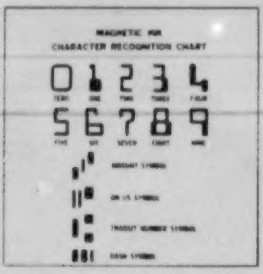

MAGNETIC INK
CHARACTER RECOGNITION CHART
0 1 2 3 4
ZERO ONE TWO THREE FOUR
5 6 7 8 9
FIVE SIX SEVEN EIGHT NINE
AMOUNT SYMBOL
ON US SYMBOL
TRANSIT NUMBER SYMBOL
DASH SYMBOL

FIGURE 9

MICR Character Set

D. Bar-code reader (Figure 10)

1. Scans documents on which bars or lines represent data
2. Can record data directly into computer or enter on input media for subsequent processing by the computer
3. Generally used by grocery stores, post offices, and credit card processors
4. Usually not readable by humans

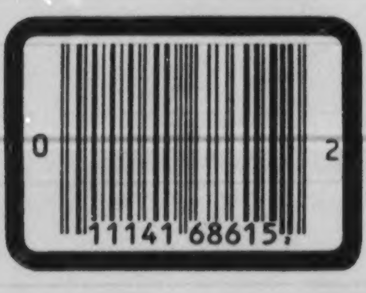

0
2
11141 68615

FIGURE 10 Bar Code Reader

INFORMATION SHEET

VIII. Other input/output devices

A. Micrographics (Figure 11)

1. Microfilm

   a. Requires two percent of the space of paper records

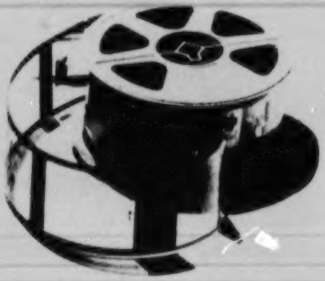
   b. May be indexed and coded

   (NOTE: Microfilm output is referred to as COM, the abbreviation of *Computer Output Microfilming.*)

   c. Similar to a roll of 16mm film

FIGURE 11

Microfilm



2. Microfiche (Figure 12)

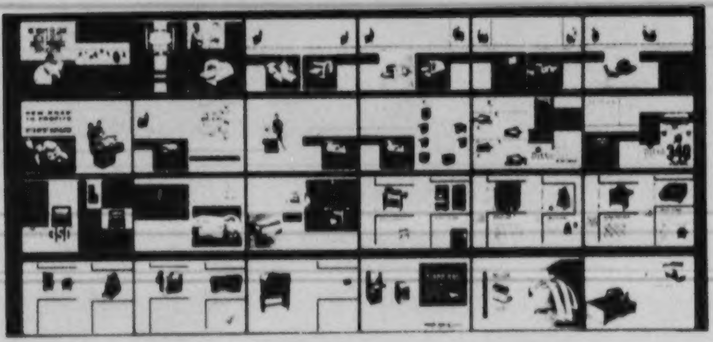
   a. Measures 4" x 6"

   b. Holds 60 to 90 pages of copy on a transparent card

   c. Used for publications and reports that are needed for frequent reference and distribution

FIGURE 12

Microfiche



INFORMATION SHEET

B. Facsimile (Figure 13)

1. Reads hard copy in one location and produces it in another
2. Sends through space or telephone wires
3. Slow
4. Expensive

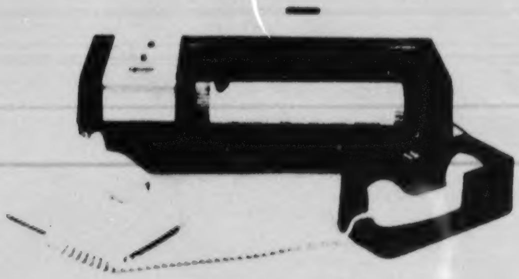


FIGURE 13 A Facsimile

C. Dictation/transcription

1. Machine shorthand
    a. Dictation captured on magnetic tape cassette which is used as an input device for transcription
    b. Information input in a shorthand system composed of letters that will allow operator to write whole words by depressing one or more keys at one time
    c. Revisions may be made on a video display terminal

       (NOTE: The information is displayed as if the document had been keyboarded on it.)
2. Dictation machine
    a. Consists of three parts
        (1) Dictation unit
        (2) Recording unit
        (3) Transcribing unit
    b. May be portable desk-top or centralized
    c. Provides input or the means to record spoken word
    d. Uses floppy disks, cassette tapes, or magnetic belts

INFORMATION SHEET

3. Transcription

   a. Produces output--Printed word from recorded word

   b. Types of transcription devices

      (1) Stand-alone text-editing typewriters

      (2) Shared-logic text-editing systems

D. Audio response unit

1. Produces large amounts of written communication

2. Provides a limited number of phrases or numbers that have been prerecorded by a human

3. Produces output by the computer bringing together various phrases and numbers in its vocabulary and outputting them into a message

INPUT/OUTPUT DEVICES AND THEIR MEDIA
UNIT V

ASSIGNMENT SHEET #1--COMPLETE A CROSSWORD PUZZLE ON PRINTING DEVICES

Complete the following crossword puzzle by supplying the name of the printing device that corresponds with the definition given.

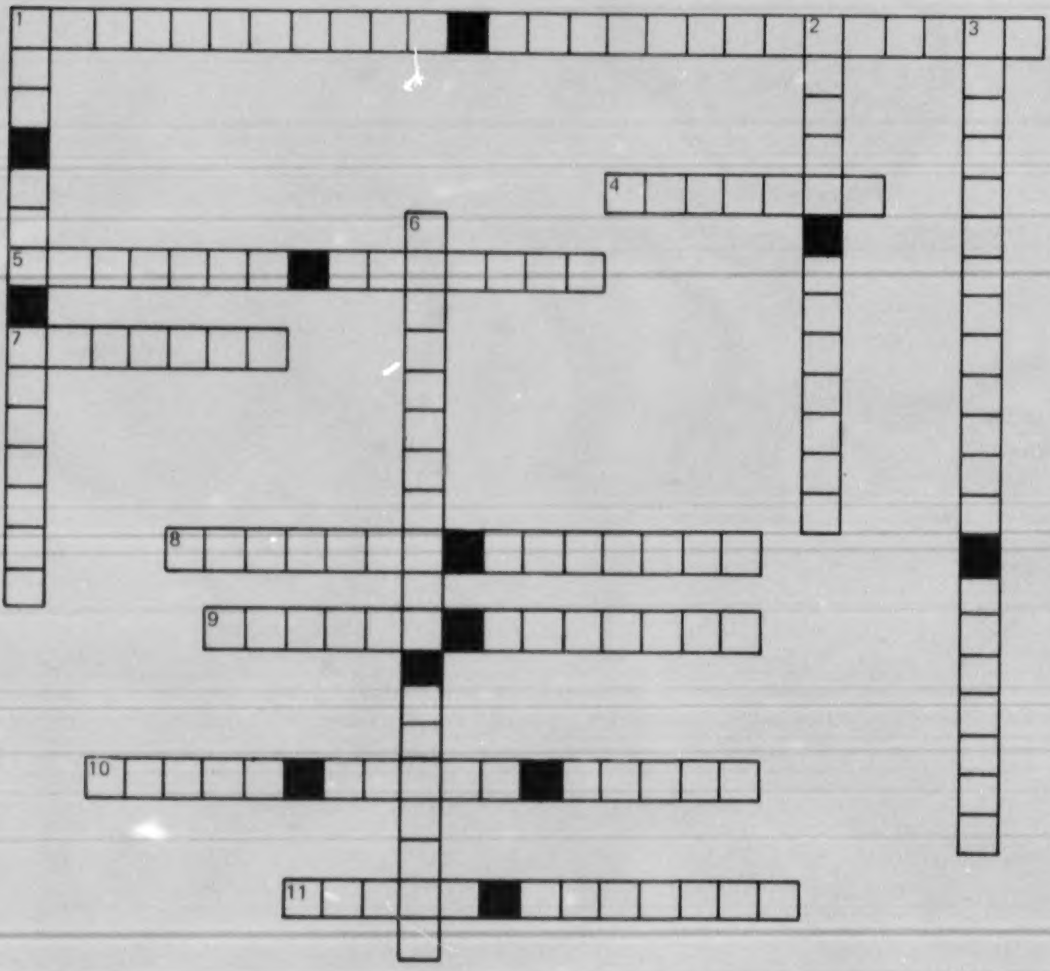
Across

1. A printer which combines laser, computer, and some photocopying technology to produce printed output; input may come from magnetic cards or through telephone lines from a computer or word processor
4. The typing component on an electric typewriter shaped in the form of a golf ball
5. Heating elements which burn characters onto chemically treated paper
7. A printing device capable of providing continuous line drawings and pictorial solutions to data processing problems; offers a picture not possible with conventional line printers
8. A bar mounted on an impact printer that holds type slugs
9. A high-speed printer that prints character-like configurations of dots
10. A plastic or metal printing device in the shape of a wheel which resembles a flattened daisy with each of 92 or 96 characters on the spoke of the wheel
11. A low-power laser creates character images that are electrostatically transferred to the paper to produce printed output

Down

1. Electronically charged magnetic ink is sprayed onto the surface of paper; approximately 100 characters per second
2. A flexible chain of characters which rotates with the printer placing the character in front of the desired print position; 600 to 2,400 lines per minute
3. Employs a process similar to a copying machine to print data
6. Represents printed data in the form of dots created by the ends of a matrix of wires which strike paper; 80 to 400 lines per minute

ASSIGNMENT SHEET #1


1
2
3
4
5
6
7
8
9
10
11

INPUT/OUTPUT DEVICES AND THEIR MEDIA
UNIT V

ASSIGNMENT SHEET #2--LOCATE OPTICAL READING CHARACTERS

Directions: Locate two examples of each of the following reading characters: optical character recognition, magnetic-ink characters, and bar codes. Paste up the examples below and hand in to the instructor.

INPUT/OUTPUT DEVICES AND THEIR MEDIA
UNIT V

ASSIGNMENT SHEET #3--DICTATE AND TRANSCRIBE INFORMATION

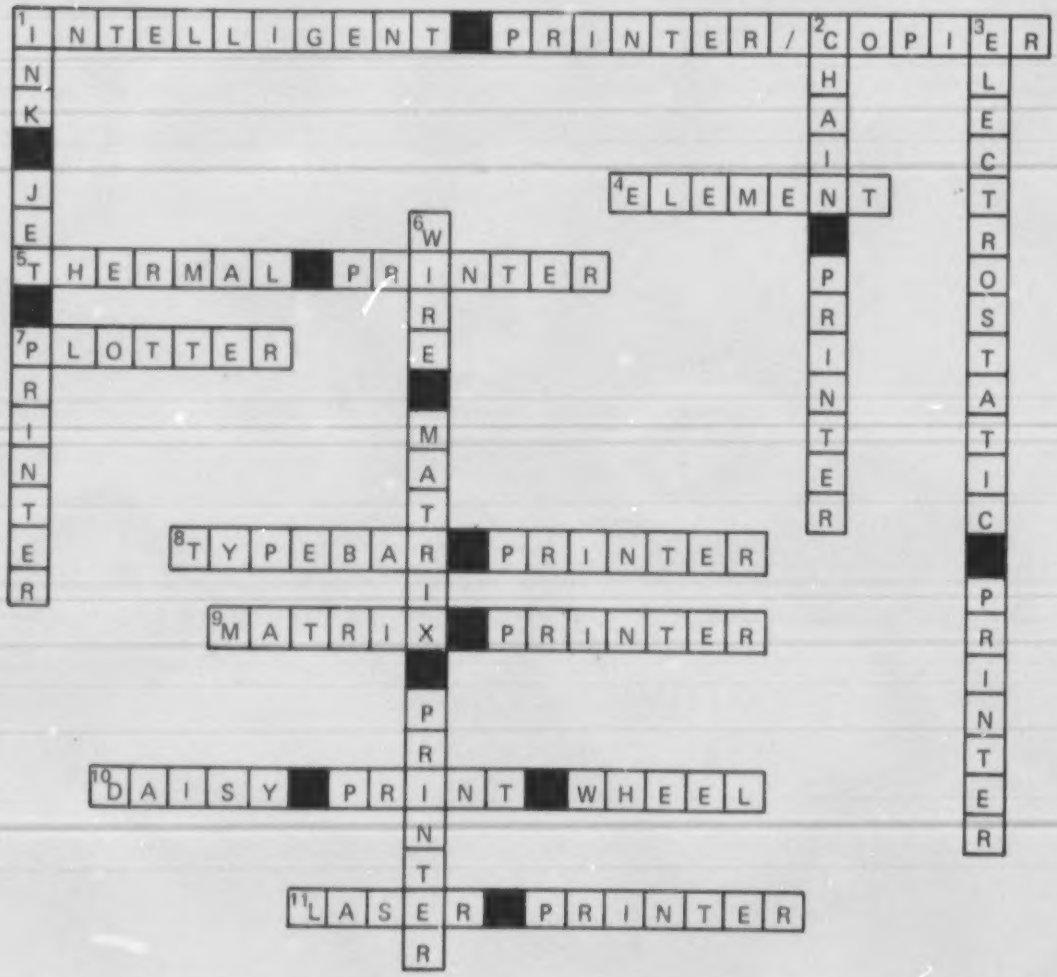
Directions: Using a dictation unit, dictate, in your own words, a business letter. Organize thoughts before dictating. After dictating, transcribe the letter on the transcribing unit and hand in to instructor.

(NOTE: If a school does not have the above equipment available, one student should dictate to another; the second student should transcribe the letter on the typewriter. After following this procedure, change roles. Hand in finished material to instructor.)

INPUT/OUTPUT DEVICES AND THEIR MEDIA
UNIT V

ANSWERS TO ASSIGNMENT SHEET

Assignment Sheet #1


1 INTELLIGENT PRINTER/COPIER
1 INK JET PRINTER
2 CHAIN PRINTER
3 ELECTROSTATIC PRINTER
4 ELEMENT
5 THERMAL PRINTER
6 WIRE MATRIX PRINTER
7 PLOTTER
8 TYPEBAR PRINTER
9 MATRIX PRINTER
10 DAISY PRINT WHEEL
11 LASER PRINTER

Assignment Sheet #2--Evaluated to the satisfaction of the instructor

Assignment Sheet #3--Evaluated to the satisfaction of the instructor

INPUT/OUTPUT DEVICES AND THEIR MEDIA
UNIT V

NAME ______________________________

TEST

1. Match the terms on the right with the correct definitions.

______a. A storage medium in which data is represented by means of holes punched in vertical columns in a paper card

______b. The computer code employed with the 80-column card, composed of punches made in the 12 rows of the card

______c. Physically strikes paper surface leaving character images on paper similar to a typewriter

______d. File storage where any record can be accessed without the need to access all preceding records

______e. Medium on which data is recorded in the form of magnetized spots on the surface of magnetically sensitive coated tape

______f. Feature of magnetic media which makes it possible to find information instantly on the medium without regard to the sequence

______g. The process of transmitting textual and illustrative copy electronically

______h. A vacuum tube with a screen and a controlled beam of electrons that may be used as a display or a storage device

______i. A system in which retail goods are labeled with machine-readable symbols and in which cashier checkout stations are equipped with devices for reading these labels

______j. Thin metal disk coated on each side so that data can be recorded in the form of magnetized spots

______k. Forms characters by either transferring electrical charges or making thermal imprints on the paper

1. Cathode ray tube
2. Direct access
3. Direct access storage
4. Facsimile
5. Hollerith code
6. Impact printer
7. Input/output devices
8. Magnetic disk
9. Magnetic tape
10. Non-impact printer
11. Point-of-sale automation
12. Punched card
13. Sequential access

______l. Device mechanisms for reading in data to be processed and for reporting results

______m. Data retrieved from a file, one record after another in a pre-determined sequence

2. Match the types of paper media with their characteristics.

(NOTE: Answers may be used more than once.)

______a. Uses Hollerith code

______b. Uses BCD code

______c. Data recorded in channels, similar to magnetic tape

______d. Stores 20% more information than 80-column card

______e. This medium has a storing and handling problem

______f. This medium is less vulnerable to variations of moisture and temperature

1. Paper tape
2. 96-column card
3. 80-column card

3. Select true statements concerning devices which use paper media by placing an "X" in the appropriate blanks.

______a. The card reader is designed to recognize holes punched in a card and transmit information in an electronic form to the computer

______b. The card punch is not linked directly to the computer

______c. The brush-type reader and the photoelectric reader are two types of card readers

______d. The card reader/punch may read one card while another is being punched

______e. The paper tape reader senses the presence or absence of holes and converts them into electronic impulses

______f. The paper tape punch is not used to provide computer output

4. Classify printing devices by labeling "I" for impact printer and "N" for non-impact printer.

______a. Electrostatic printer

______b. Matrix printer

______c. Chain printer

______d. Thermal printer

______e. Daisy print wheel

______f. Element

______g. Wire-matrix printer

______h. Intelligent printer/copier

______i. Laser printer

______j. Ink jet printer

______k. Typebar printer

______l. Plotter

5. Match the types of magnetic media on the right with their characteristics.

(NOTE: Answers may be used more than once.)

______a. A thin metal platter coated on both sides with a ferrous oxide material

______b. One of the most popular media for representing information

______c. Large direct access storage capacity at a reasonable cost

______d. Flexible, oxide-coated mylar disks stored in paper or plastic envelopes

______e. Widely used in text-editing minicomputer and microcomputer systems

______f. Main use is for storing large amounts of sequential data

1. Magnetic tape
2. Magnetic disk
3. Magnetic floppy disk

6. Match the types of keyboard devices on the right with their characteristics.

(NOTE: Answers may be used more than once.)

______a. Early method of recording printed output

______b. Uses a cathode ray tube for output

______c. Provides a combination input/output piece of equipment

______d. Slowest method

______e. Models include manual, electric, and text-editor

1. Typewriter
2. Video display terminal
3. Data collection device

______f. Displays up to 2000 characters

______g. Captures data in machine-readable form

______h. May connect a hardcopy terminal to obtain hardcopy output

______i. Used in manufacturing plants to collect production data

7. Match the types of optical reading equipment on the right with their characteristics.

(NOTE: Answers may be used more than once.)

______a. Contains specially shaped characters

______b. Generally used in banks to process checks and deposits

______c. Used primarily for data collection, test scores, and inventory control

______d. Identifies entire character by comparing it with similar character in memory

______e. Transmits data to computer and records automatically on another medium

______f. Does not require special ink

______g. Generally used by grocery stores, post offices, and credit card processors

______h. Scans documents on which bars or lines represent data

______i. Usually not readable by humans

______j. Is in a readable form

______k. Transfers off-line and on-line

______l. Reads data from cards, pencils, and marks

1. Optical-mark reader
2. Optical character recognition (OCR)
3. Magnetic-ink character reader (MICR)
4. Bar-code reader

8. Select true statements concerning other input/output devices by placing an "X" in the appropriate blanks.

_____a. Microfiche is similar to a roll of 16mm film

_____b. Microfilm requires two percent of the space of paper records

_____c. Microfiche holds 60 to 90 pages of copy

_____d. Facsimile is a fast and low cost method of sending printed copy from one location to another

_____e. Once information is inputted from machine shorthand, revisions may not be done unless resubmitted through the shorthand machine

_____f. Dictation machines use only magnetic belts

_____g. There are two types of transcription devices: stand-alone text-editing typewriters and shared-logic text-editing systems

_____h. The audio response unit produces large amounts of written communication

9. Complete a crossword puzzle on printing devices.

10. Locate optical reading characters.

11. Dictate and transcribe information.

(NOTE: If activities 9-11 have not been accomplished prior to the test, ask your instructor when they should be completed.)

INPUT/OUTPUT DEVICES AND THEIR MEANING
UNIT V

ANSWERS TO TEST

1. a. 12
   b. 5
   c. 6
   d. 3
   e. 9
   f. 2
   g. 4
   h. 1
   i. 11
   j. 8
   k. 10
   l. 7
   m. 13

2. a. 3
   b. 2
   c. 1
   d. 2
   e. 2 or 3
   f. 1

3. a, c, d, e

4. a. N
   b. N
   c. I
   d. N
   e. I
   f. I
   g. I
   h. N
   i. N
   j. N
   k. I
   l. N

5. a. 2
   b. 1
   c. 2
   d. 3
   e. 3
   f. 1

6. a. 1
   b. 2
   c. 2
   d. 1
   e. 1
   f. 2
   g. 3
   h. 2
   i. 3

7. a. 2
   b. 3
   c. 1
   d. 2
   e. 1
   f. 2
   g. 4
   h. 4
   i. 4
   j. 3
   k. 3
   l. 1

8. b, c, g, h

9. Evaluated to the satisfaction of the instructor

10. Evaluated to the satisfaction of the instructor

11. Evaluated to the satisfaction of the instructor

METHODS OF STORING AND RETRIEVING INFORMATION
UNIT VI

UNIT OBJECTIVE

After completion of this unit, the student should be able to complete a word search, use an array, and prepare information for storing. The student should also be able to store and retrieve information, and prepare a report on the storage and retrieval of information. This knowledge will be evidenced by correctly performing the procedures outlined in the assignment sheets and by scoring 85 percent on the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms related to the methods of storing and retreiving information with the correct definitions.
2. Identify the three components of data storage.
3. Match the primary storage media with their characteristics.
4. Select true statements concerning file organization.
5. Complete a word search.
6. Use an array.
7. Prepare information for storing
8. Store information using a computer.
9. Store and retrieve a letter.
10. Prepare a report on the storage and retrieval of information.

METHODS OF STORING AND RETRIEVING INFORMATION
UNIT VI

SUGGESTED ACTIVITIES

I. Provide student with objective sheet.

II. Provide student with information and assignment sheets.

III. Make transparency.

IV. Discuss unit and specific objectives.

V. Discuss information and assignment sheets.

VI. Bring disks and tapes to class so students can examine them.

VII. Have guest speakers come to class to talk about data storage and retrieval.

VIII. Develop a file of information.

IX. If a computer is available, prepare exercises related to storage and retrieval.

X. Use word processing equipment to demonstrate the storage and retrieval of information.

XI. Have students search newspapers and magazines for articles about equipment and have them report on these orally in class.

XII. Assist students in organizing the information in Assignment Sheet #3.

XIII. Make arrangements for a computer to use with Assignment Sheet #4.

XIV. Have students draw cartoons of unusual happenings related to storage and retrieval.

XV. Give test.

INSTRUCTIONAL MATERIALS

I. Include in this unit:

    A. Objective sheet

    B. Information sheet

    C. Transparency Master 1--Elements of Data Storage

D. Assignment Sheets

1. Assignment Sheet #1--Complete a Word Search
2. Assignment Sheet #2--Use an Array
3. Assignment Sheet #3--Prepare Information for Storing
4. Assignment Sheet #4--Store Information Using a Computer
5. Assignment Sheet #5--Store and Retrieve a Letter
6. Assignment Sheet #6--Prepare a Report on the Storage and Retrieval of Information

E. Answers to assignment sheets

F. Test

G. Answers to test

II. References:

A. Dock, D. Thomas, and Edward Essick. *Principles of Business Data Processing.* Chicago: Science Research Associates, 1980.

B. Cougar, J. Daniel and Fred McFadden. *A First Course in Data Processing.* New York: John Wiley and Sons, 1977.

C. Spencer, Donald D. *Data Processing: An Introduction.* Columbus, OH: Charles E. Merrill Publishing Company, 1978.

D. Orilia, Lawrence S. *Introduction to Business Data Processing.* New York: McGraw-Hill Book Company, 1979.

E. Shelly, Gary B. and Thomas J. Cashman. *Introduction to Computers and Data Processing.* Fullerton, CA: Anaheim Publishing Company, 1980.

F. Bohl, Marilyn. *Information Processing.* Third Edition. Chicago: Science Research Associates, 1980.

METHODS OF STORING AND RETRIEVING INFORMATION
UNIT VI

INFORMATION SHEET

I. Terms and definitions

A. Sequential storage medium--Medium which reads and/or writes information in order, one record at a time

B. Read/write head--Small electromagnetic component used for reading, writing, or erasing the polarized spots that represent data on magnetic media

C. Density--The number of bytes of data that are recorded on one inch of magnetic tape or in one sector of a floppy disk

D. Interblock gap (IBG)--A blank space between blocks of data on magnetic tape, which enables the tape to accelerate to the proper reading speed and decelerate from that speed

E. Blocking factor--The factor that indicates the number of records contained in one block of data on a magnetic tape

F. Expiration date--The part of a header label that indicates the latest possible date a file can be used in processing

G. Load-point marker--A reflective strip at the beginning of a reel of tape indicating the physical point that data can be recorded

H. Tape marks--A special code character placed at the end of each data file stored on tape

I. Tracks--One of several concentric circular rings in which information is stored on a magnetic disk

J. Sector--A portion of a track from a magnetic disk on which data is stored

(NOTE: The shape is similar to a slice of pie.)

K. Cylinder--A group of tracks that have the same number comprising one track on each of the recording surfaces of a magnetic disk pack

L. Access time--The amount of time necessary to locate and retrieve an item of data from secondary storage

M. Rotational delay--The time necessary for the magnetic disk to spin and place the desired data beneath the proper read/write head

N. Data transfer rate--The speed at which data is transferred between the CPU and its secondary storage devices

O. On-line--In direct communication with the computer

INFORMATION SHEET

P. Real time--An on-line processing system in which data is processed the instant it occurs

(NOTE: No delays exist between the time that data is available and the time it is processed.)

Q. Array--A systematic arrangement of elements in a table format

(NOTE: An example of an array is an income tax table.)

II. Components of data storage (Transparency 1)

A. File--Set of related records treated as a unit

Example: A payroll file containing data related to employee's name, social security number, deductions, total monies paid, and taxes withheld during the current year

B. Record

1. Collection of related files treated as a unit

Example: In stock control, each invoice could constitute one record

2. Usually grouped together to form a file

C. Field

1. Unit of data within a record

Example: A name field, an address field, a city/state field

2. Data commonly grouped to form a record

III. Primary storage media

A. Magnetic tape

1. Sequential storage medium

2. Tape reels are usually 2400 feet long, and plastic coated with a magnetizable surface

3. Storage capacity of over 20 million characters of data

4. Tape must pass through a read/write head to record information

5. Storage density is commonly 800 BPI, 1200 BPI, 1600 BPI, 3200 BPI, or 6400 BPI

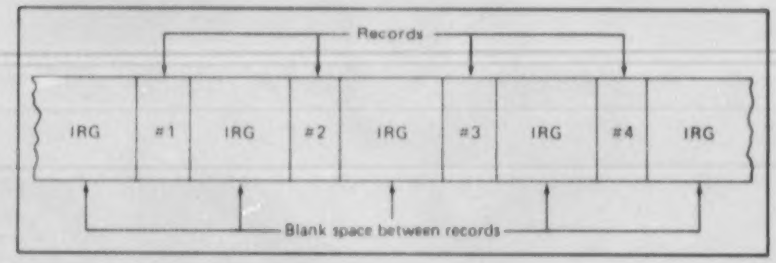
(NOTE: BPI is the abbreviation for bytes per inch.)

INFORMATION SHEET

6. Interrecord gap separates one record from the next and helps maintain connection for reading data (Figure 1)

FIGURE 1

Interrecord Gap


Records
IRG
#1
IRG
#2
IRG
#3
IRG
#4
IRG
Blank space between records

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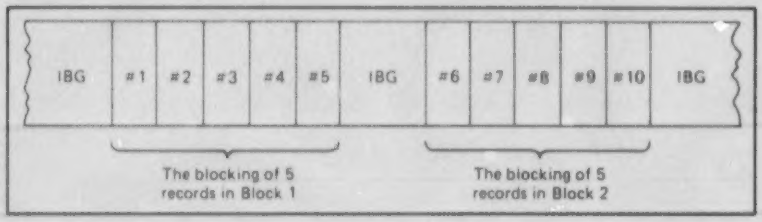
7. Interblock gap (IBG) was developed to take the place of the interrecord gap (Figure 2)

   (NOTE: The change was made to improve the speed and efficiency of magnetic tape processing.)

FIGURE 2

Interblock Gap


IBG
#1
#2
#3
#4
#5
IBG
#6
#7
#8
#9
#10
IBG
The blocking of 5 records in Block 1
The blocking of 5 records in Block 2

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8. Records are grouped together to form blocks

9. Blocks of data are separated by interblock gaps

   (NOTE: The blocking factor defines the number of records per block.)

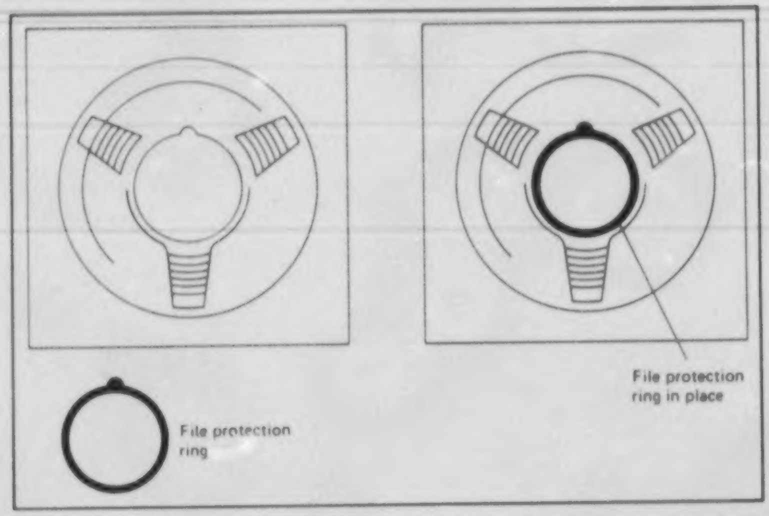
INFORMATION SHEET

10. File protection rings were developed to safeguard tape files; when in place, file can be read only (Figure 3)

    (NOTE: This may be reversed, depending upon the equipment.)

FIGURE 3

File Protection Rings


File protection ring
File protection ring in place

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11. Header labels appear at the beginning of every tape file and contain data relating to the file (Figure 4)

    (NOTE: The file's ID number and expiration data are used in a label checking operation which insures the use of the correct tape.)

12. Load-point marker is positioned at the beginning of the tape

    (NOTE: These are made out of aluminum.)

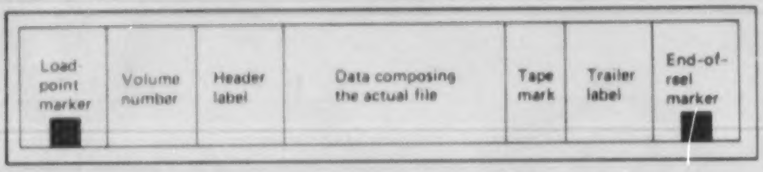
13. End-of-reel marker is positioned at the end of the tape

    (NOTE: These are made out of aluminum.)

14. Tape marks appear at the end of each individual file

FIGURE 4

Relationship of Header Label to Other Physical Features


Load-point marker
Volume number
Header label
Data composing the actual file
Tape mark
Trailer label
End-of-reel marker

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INFORMATION SHEET

B. Magnetic disk

1. Random direct-access storage medium
2. Flat, circular recording surface on which data is stored

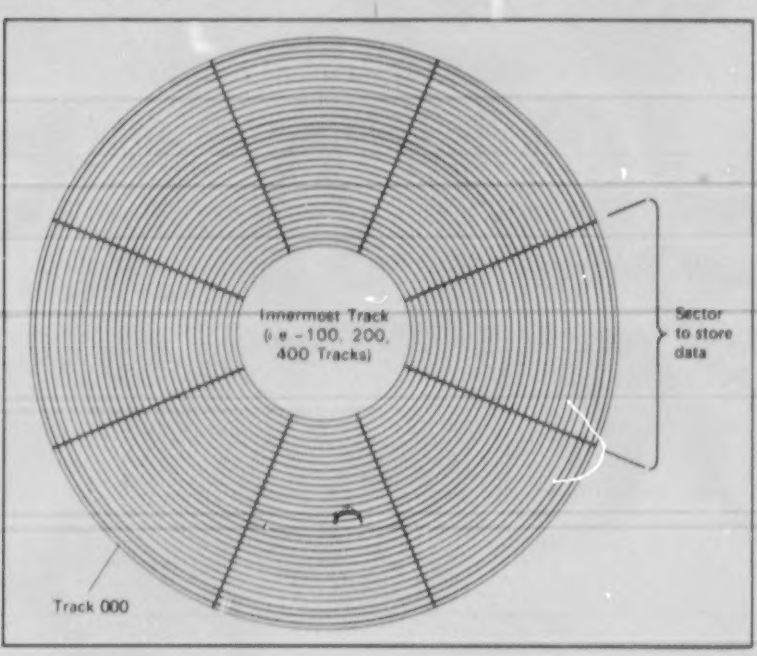
   (NOTE: A collection of disks are stored in disk packs.)

3. Read/write heads
   a. One head for each surface
   b. All heads move at the same time
   c. All heads attached to one access arm
4. Tracks (Figure 5)
   a. Each track divided into sectors
   b. First track on each surface is numbered 000

      (NOTE: These numbers are necessary when storing or retrieving information.)

FIGURE 5

Tracks Composing a Disk



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INFORMATION SHEET

5. Data stored on disk by cylinders

6. Access time components

   a. Head selection

   b. Head position

   c. Rotational delay

   d. Data transfer rate

7. Types of disks

   a. Removable

   b. Nonremovable

IV. File organization

A. Sequential file

1. Organized in either ascending or descending order

2. One file is read at a time

3. Suitable for use with both magnetic tape and batch processing

4. Advantages

   a. Low cost

   b. Efficient

   (NOTE: This type of file organization is as efficient as the batch processing medium.)

5. Disadvantages

   a. Cannot support on-line processing

   b. Extra work is required prior to processing

   c. Entire file must be processed in order to update a few records

   Example: Reading from page 1 to page 100 to update data on page 100

INFORMATION SHEET

B. Random access file

  1. All records independently accessible

     Example: Opening a reference text to exact page where information is located

  2. Suited to direct access devices

  3. Uses an identifying key

     (NOTE: The identifying key computes the actual storage location of the files.)

  4. Advantages

     a. Minimum amount of work required for the preparation of information

     b. Supports on-line or real-time processing

     c. Coordinates use of multiple information files

     d. Fast data retrieval

  5. Disadvantages

     a. High cost

     b. Time lost in computing storage location

     c. Lack of security

        (NOTE: File protection must be maintained for proper security.)

C. Indexed sequential file (ISAM)

  1. Combination of sequential and random access files

  2. Uses a table to create key points

  3. Advantage--Can be processed in a random and sequential manner

  4. Disadvantages

     a. Requires more processing time

     b. Difficult structure to work with

        (NOTE: When seeking a record, the table is randomly accessed to storage location and then sequentially read to the desired record.)

INFORMATION SHEET

D. Data base

1. Developed as a result of the large growth of business data

2. Tied together by a group of tables and arrays

   (NOTE: These form one integrated file that serves as an index to define relationships between records and files maintained in the data base.)

3. Used so that data files are not duplicated

   (NOTE: The same data items are not reprocessed, and data is not repeatedly handled.)

4. Advantages

   a. Improves overall efficiency of computer system

   b. Reduces processing time

   c. Reduces use of software and hardware

   d. More efficient use of data processing personnel

   e. Improvement in flow of data

5. Disadvantages

   a. Cost

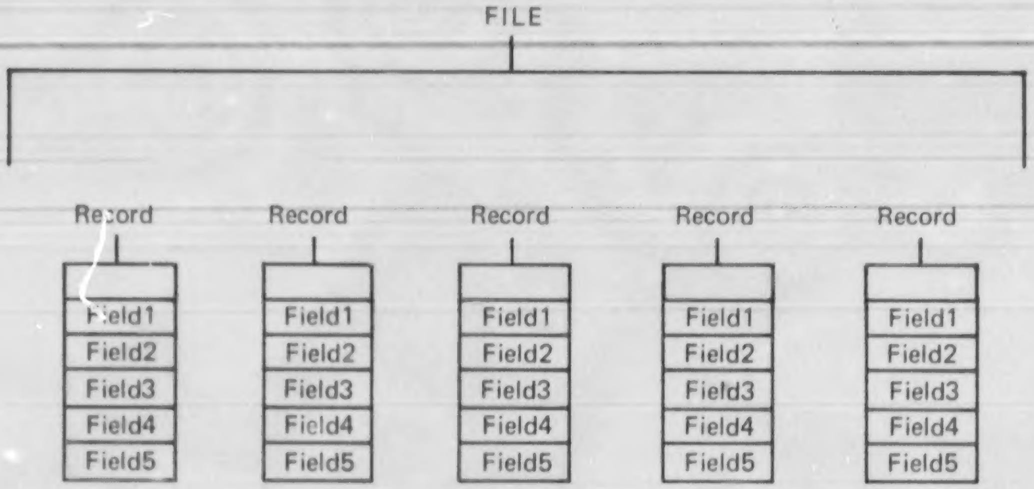
   b. Size

   c. Time required to implement such a system

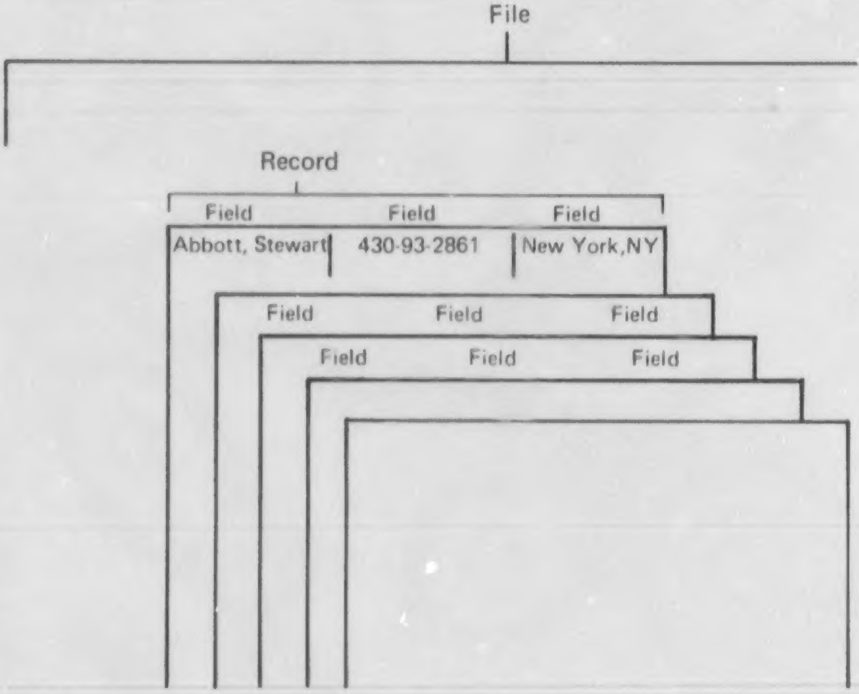
   d. Requires large-scale computer system

   e. Full staff necessary to support its use

Components of Data Storage


FILE
Record
Record
Record
Record
Record
Field1
Field2
Field3
Field4
Field5
Field1
Field2
Field3
Field4
Field5
Field1
Field2
Field3
Field4
Field5
Field1
Field2
Field3
Field4
Field5
Field1
Field2
Field3
Field4
Field5

Example


File
Record
Field
Field
Field
Abbott, Stewart
430-93-2861
New York,NY
Field
Field
Field
Field
Field
Field

METHODS OF STORING AND RETRIEVING INFORMATION
UNIT VI

ASSIGNMENT SHEET #1–COMPLETE A WORD SEARCH

Directions: Complete the following word search pertaining to terms associated with methods of retrieving and storing information by circling the appropriate words that appear horizontally, vertically, and diagonally on the next page.

a. The amount of time necessary to locate and retrieve an item of data from secondary storage

b. Medium which reads and/or writes information in order, one record at a time

c. In direct communication with the computer

d. The number of bytes of data that are recorded on one inch of magnetic tape or in one sector of a floppy disk

e. The factor that indicates the number of records contained in one block of data on a magnetic tape

f. The part of a header label that indicates the latest possible date a file can be used in processing

g. A systematic arrangement of elements in a table format

h. The speed at which data is transferred between the CPU and its secondary storage devices

i. An on-line processing system in which data is processed the instant it occurs

j. A blank space between blocks of data on magnetic tape, which enables the tape to accelerate to the proper reading speed and decelerate from that speed

k. A reflective strip at the beginning of a reel of tape indicating the physical point that data can be recorded

l. Small electromagnetic component used for reading, writing, or erasing the polarized spots that represent data on magnetic media

m. The time necessary for the magnetic disk to spin and place the desired data beneath the proper read/write head

n. A portion of a track from a magnetic disk on which data is stored

o. A special code character placed at the end of each data file stored on tape

p. One of several concentric circular rings in which information is stored on a magnetic disk

q. A group of tracks that have the same number comprising one track on each of the recording surfaces of a magnetic disk pack

ASSIGNMENT SHEET #1

I B K M H S K R A M E P A T D V J F I H A F S

G D R O C E R B J C D Q S Y A R R A L U O Q E

A T Q W F U L Z S L O N B Y T N Z L N G I W Q

H R E Y P B H P E E M I T L A E R E B S A P U

V E R V Z K A I K I R V E U T V Y V T D C I E

S Y E C Z M F J G C L E T K R T A Z W R C W N

D Z K X O C E A L Y S B A T A Y L U V H E P T

W Q R R Y N B F D A I A D N N M E C T O S V I

T P A G K C O L B R E T N I S Y D N G M S L A

Y T M S D G K A H F D L O J F F L O S Q T A L

R W T H G L T J W I E Q I B E N A D Y C I A S

Z A N Q M A M P E B C P T C R E N P T O M Z T

U H I P D M T R A C K S A D R Z O J I B E U O

K O O N L B O L H F E G R M A Y I N S T Y S R

C L P I C N R I L C E B I Q T I T K N Y A T A

J X D D I E H E T N K J P Y E L A E E U C A G

E M A B D F G O I G B I X W I X T H D D B G E

D S O A G Y R L K N R T E V N Z O J M K B L M

Q O L A Z S N Y L Z S O U D G M R G F N Q O E

T H X F S O Q U E N C Y L I N D E R R C U V D

R O E X J H D B L O C K I N G F A C T O R W I

W U D U E A X C D A E H E T I R W / D A E R U

T W N V W I K B Z B W A M G V L H D O I R J M

METHODS OF STORING AND RETRIEVING INFORMATION
UNIT VI

ASSIGNMENT SHEET #2--USE AN ARRAY

Directions: Complete the sentence at the bottom of the page by choosing words, as directed under each line, from either Array A or Array B.

	Array A
Row 1	of
Row 2	is
Row 3	Array
Row 4	you
Row 5	are
Row 6	me

Array B	Column 1	Column 2	Column 3	Column 4
Row 1	choosing	example	control	array
Row 2	a	single	is	single
Row 3	Pascal	dimension	A	CPU
Row 4	B	an	double	and

____ Array A Row 3	____ Array B Row 3 Column 3	____ Array B Row 2 Column 3	____ Array B Row 4 Column 2	____ Array B Row 1 Column 2	____ Array A Row 1	____ Array B Row 2 Column 1
____ Array B Row 2 Column 4	____ Array B Row 3 Column 2	____ Array A Row 3	____ Array B Row 4 Column 4	____ Array B Row 1 Column 4	____ Array A Row 4 Column 1	
____ Array A Row 1	____ Array B Row 2 Column 2	____ Array B Row 4 Column 3	____ Array B Row 3 Column 2	____ Array A Row 3		

METHODS OF STORING AND RETRIEVING INFORMATION
UNIT VI

ASSIGNMENT SHEET #3--PREPARE INFORMATION FOR STORING

(NOTE: This assignment is designed as a group activity with each student in the class providing information.)

1. Provide personal data including:
   a. Name
   b. Age
   c. Grade
   d. Sex
2. Set field limits for each category.
3. Code each category using either numeric, alphabetic, or alphanumeric codes.
4. Sort the information according to:
   a. Alphabetical order of names
   b. Age
   c. Grade
   d. Sex
5. Compute percentages for each category.

   Example: Number in each class, percentage male and female, percentage in each age group
6. Verify the percentages with other class members.

   (NOTE: Retain this information for use in the next assignment sheet.)

METHODS OF STORING AND RETRIEVING INFORMATION
UNIT VI

ASSIGNMENT SHEET #4--STORE INFORMATION USING A COMPUTER

Directions: Using the information compiled in Assignment Sheet #3 (name, age, grade, and sex of class members) compute the percentages for each category through the use of a computer.

If a school computer is not available, take this information to a local business to be key punched and to have the data go through both the input and output stages.

Compare the speed and efficiency in preparing the information by hand versus using the computer.

METHODS OF STORING AND RETRIEVING INFORMATION
UNIT VI

ASSIGNMENT SHEET #5–STORE AND RETRIEVE A LETTER

Directions: Using available word processing equipment, write a thank you letter to one of the resource people who has made a presentation to the class this year.

1. Use a standard format for writing the letter.
2. Input the letter.
3. Make corrections to the original copy.
4. Output the corrected copy.
5. Submit to instructor for approval prior to mailing.

METHODS OF STORING AND RETRIEVING INFORMATION
UNIT VI

ASSIGNMENT SHEET #6–PREPARE A REPORT ON THE STORAGE AND RETRIEVAL OF INFORMATION

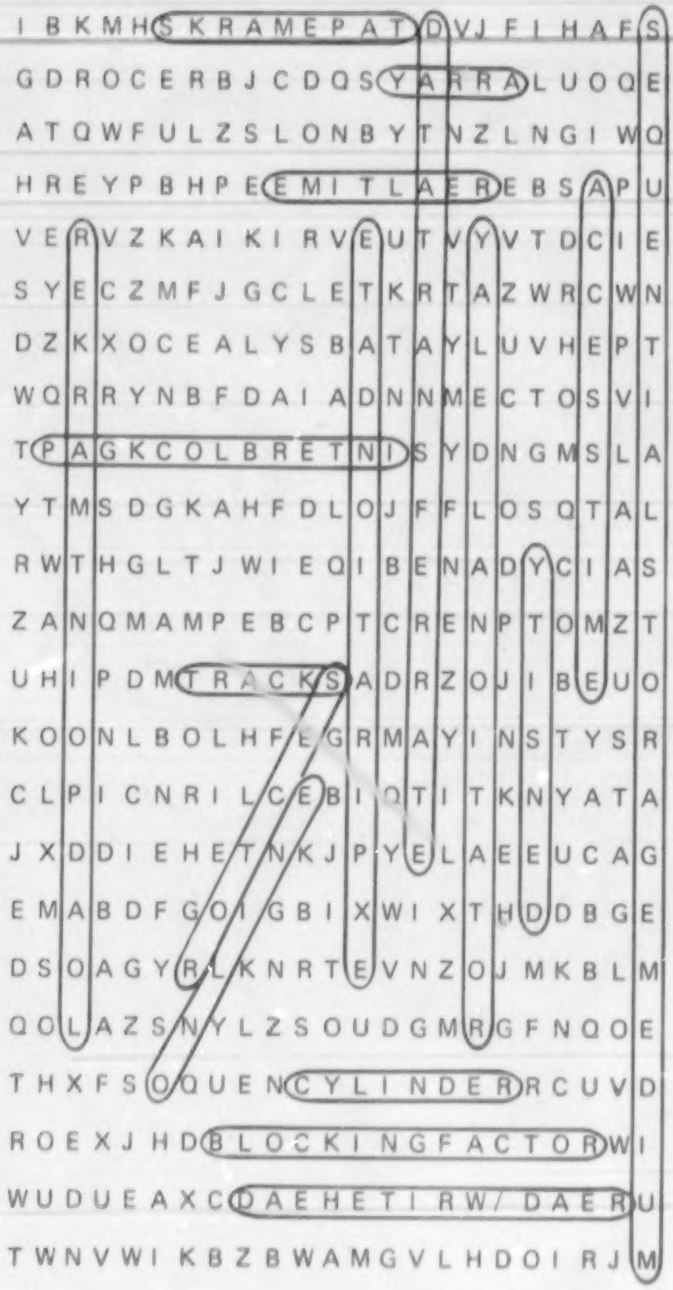
Directions: Using available periodicals such as newspapers, magazines, pamphlets and books, prepare a report about the storage and/or retrieval of data using an information processing system. Use the following information as a guide in preparing the report.

1. What reference(s) were used?
2. What equipment was used?
3. What are the advantages of such a system?
4. Are the events and equipment in the article practical for your community?
5. Is this something that particularly interests you? If so, why?

METHODS OF STORING AND RETRIEVING INFORMATION
UNIT VI

ANSWERS TO ASSIGNMENT SHEETS

Assignment Sheet #1



```
I B K M H S K R A M E P A T D V J F I H A F S
G D R O C E R B J C D Q S Y A R R A L U O Q E
A T Q W F U L Z S L O N B Y T N Z L N G I W Q
H R E Y P B H P E E M I T L A E R E B S A P U
V E R V Z K A I K I R V E U T V Y V T D C I E
S Y E C Z M F J G C L E T K R T A Z W R C W N
D Z K X O C E A L Y S B A T A Y L U V H E P T
W Q R R Y N B F D A I A D N N M E C T O S V I
T P A G K C O L B R E T N I S Y D N G M S L A
Y T M S D G K A H F D L O J F F L O S Q T A L
R W T H G L T J W I E Q I B E N A D Y C I A S
Z A N Q M A M P E B C P T C R E N P T O M Z T
U H I P D M T R A C K S A D R Z O J I B E U O
K O O N L B O L H F E G R M A Y I N S T Y S R
C L P I C N R I L C E B I Q T I T K N Y A T A
J X D D I E H E T N K J P Y E L A E E U C A G
E M A B D F G O I G B I X W I X T H D D B G E
D S O A G Y R L K N R T E V N Z O J M K B L M
Q O L A Z S N Y L Z S O U D G M R G F N Q O E
T H X F S O Q U E N C Y L I N D E R R C U V D
R O E X J H D B L O C K I N G F A C T O R W I
W U D U E A X C D A E H E T I R W / D A E R U
T W N V W I K B Z B W A M G V L H D O I R J M
```

a. Access time

b. Sequential storage medium

c. On-line

d. Density

e. Blocking factor

f. Expiration date

g. Array

h. Data transfer rate

i. Real time

j. Interblock gap

k. Load-point marker

l. Read/write head

m. Rotational delay

n. Sector

o. Tape marks

p. Tracks

q. Cylinder

Assignment Sheet #2--Array A is an example of a single dimension array and Array B is a double dimension array.

Assignment Sheets #3, #4, #5, and #6--Evaluated to the satisfaction of the instructor

METHODS OF STORING AND RETRIEVING INFORMATION
UNIT VI

TEST

NAME ______________________________

1. Match the terms on the right with the correct definitions.

_____a. One of several concentric circular rings in which information is stored on a magnetic disk

_____b. In direct communication with the computer

_____c. The number of bytes of data that are recorded on one inch of magnetic tape or in one sector of a floppy disk

_____d. Medium which reads and/or writes information in order, one record at a time

_____e. A reflective strip at the beginning of a reel of tape indicating the physical point that data can be recorded

_____f. The part of a header label that indicates the latest possible date a file can be used in processing

_____g. A blank space between blocks of data on magnetic tape, which enables the tape to accelerate to the proper reading speed and decelerate from that speed

_____h. Small electromagnetic component used for reading, writing, or erasing the polarized spots that represent data on magnetic media

_____i. The time necessary for the magnetic disk to spin and place the desired data beneath the proper read/write head

_____j. An on-line processing system in which data is processed the instant it occurs

_____k. The factor that indicates the number of records contained in one block of data on a magnetic tape

_____l. The speed at which data is transferred between the CPU and its secondary storage devices

1. Access time
2. Array
3. Blocking factor
4. Cylinder
5. Data transfer rate
6. Density
7. Expiration date
8. Interblock gap
9. Load-point marker
10. On-line
11. Read/write head
12. Real time
13. Rotational delay
14. Sector
15. Sequential storage medium
16. Tape marks
17. Tracks

______m. A special code character placed at the end of each data file stored on tape

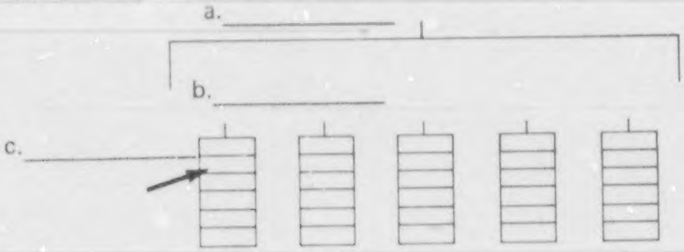
______n. A systematic arrangement of elements in a table format

______o. A group of tracks that have the same number comprising one track on each of the recording surfaces of a magnetic disk pack

______p. A portion of a track from a magnetic disk on which data is stored

______q. The amount of time necessary to locate and retrieve an item of data from secondary storage

2. Identify the three components of data storage.



3. Match the primary storage media on the right with their characteristics.

______a. Sequential storage medium	1. Magnetic tape
______b. Storage capacity of over 20 million characters of data	2. Magnetic disk
______c. Contains read/write head	
______d. Random direct-access storage medium	
______e. Contains tracks that are divided into sectors	
______f. Contains an interblock gap that was developed to replace an interrecord gap	
______g. A flat, circular recording surface on which data is stored	
______h. Its data is stored by cylinders	
______i. Records are grouped together to form blocks	

_____j. File protection rings are used to safeguard files

_____k. Header labels appear at the beginning of every file and contain data relating to the file

_____l. Access time is dependent upon head selection, head position, rotational delay, and data transfer rate

4. Select true statements concerning file organization by placing an "X" in the appropriate blanks.

_____a. Savings accrued from the use of a data base result from reduced processing times, reduced use of software and hardware, more efficient use of data processing personnel, and improved flow of data in the entire system

_____b. Indexed sequential files use a table to create key points

_____c. Sequential and indexed sequential files access data in exactly the same manner, even though they employ different file structures

_____d. An indexed sequential file has a combination of sequential and random access files

_____e. A factor relating to the development of data bases was the large growth of business data

_____f. A sequential file is more suitable for use with magnetic disks than for use with magnetic tape

_____g. Random access files support on-line or real-time processing

_____h. An example of random access files is reading from page 1 to page 100 to obtain information on page 100

_____i. The random access file is advantageous because of its low cost

5. Complete a word search.

6. Use an array.

7. Prepare information for storing.

8. Store information using a computer.

9. Store and retrieve a letter.

10. Prepare a report on the storage and retrieval of information.

(NOTE: If these activities have not been accomplished prior to the test, ask your instructor when they should be completed.)

METHODS OF STORING AND RETRIEVING INFORMATION
UNIT VI

ANSWERS TO TEST

1. a. 17
   b. 10
   c. 6
   d. 15
   e. 9
   f. 7
   g. 8
   h. 11
   i. 13
   j. 12
   k. 3
   l. 5
   m. 16
   n. 2
   o. 4
   p. 14
   q. 1

2. a. File
   b. Record
   c. Field

3. a. 1
   b. 1
   c. 2
   d. 2
   e. 2
   f. 1
   g. 2
   h. 2
   i. 1
   j. 1
   k. 1
   l. 2

4. a, b, d, e, g

5. Evaluated to the satisfaction of the instructor

6. Evaluated to the satisfaction of the instructor

7. Evaluated to the satisfaction of the instructor

8. Evaluated to the satisfaction of the instructor

9. Evaluated to the satisfaction of the instructor

10. Evaluated to the satisfaction of the instructor

UNDERSTANDING PROGRAMMING CONCEPTS AND COMPUTER LANGUAGE
UNIT VII

UNIT OBJECTIVE

After completion of this unit, the student should be able to select true statements concerning the program development process, and match system flowcharting descriptions and basic program flowcharting descriptions with their symbols. The student should also be able to solve a problem using steps outlined in a flowchart and construct a simple program flowchart. This knowledge will be evidenced by correctly performing the procedures outlined in the assignment sheets and by scoring 85 percent on the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms associated with understanding programming concepts and computer language with the correct definitions.
2. Select true statements concerning the program development process.
3. Match system flowcharting descriptions with their symbols.
4. Match basic program flowcharting descriptions with their symbols.
5. Match primary programming languages with their descriptions.
6. Solve a problem using steps outlined in a flowchart.
7. Complete a simple program flowchart.
8. Construct a simple program flowchart.

UNDERSTANDING PROGRAMMING CONCEPTS AND COMPUTER LANGUAGE
UNIT VII

SUGGESTED ACTIVITIES

I. Provide student with objective sheet.

II. Provide student with information and assignment sheets.

III. Make transparencies.

IV. Discuss unit and specific objectives.

V. Discuss information and assignment sheets.

VI. Have guest speakers who use programming concepts and computer language talk to the class concerning them.

VII. Have students draw a flowchart depicting their activities for one day from the time they get up until the time they go to bed.

IX. Give test.

INSTRUCTIONAL MATERIALS

I. Included in this unit:

  A. Objective sheet

  B. Information sheet

  C. Transparency masters

    1. TM 1--System Flowchart of Data Processing Cycle
    2. TM 2--System Flowchart of Word Processing Cycle
    3. TM 3--Sample Program Flowchart
    4. TM 4--A COBOL Program
    5. TM 5--A COBOL Program (Continued)
    6. TM 6--A PL/1 Program
    7. TM 7--An RPG Program
    8. TM 8--A BASIC Program

D. Assignment sheets

   1. Assignment Sheet #1–Solve a Problem Using Steps Outlined in a Flowchart

   2. Assignment Sheet #2–Complete a Simple Program Flowchart

   3. Assignment Sheet #3–Construct a Simple Program Flowchart

E. Answers to assignment sheets

F. Test

G. Answers to test

II. References:

A. Dock, D. Thomas and Edward Essick. *Principles of Business Data Processing.* Chicago: Science Research Associates, 1978.

B. Couger, J. Daniel and Fred McFadden. *A First Course in Data Processing.* New York: John Wiley and Sons, 1977.

C. Spencer, Charles E. *Data Processing: An Introduction.* Columbus, OH: Merrill Publishing Co., 1978.

D. Bohl, Marilyn. *Information Processing.* Third Edition. Chicago: Science Research Associates, Inc., 1980.

E. Shelly, Gary B. and Thomas J. Cashman *Introduction to Computers and Data Processing.* Fullerton, CA: Anaheim Publishing Co., 1980.

F. Orilia, Lawrence S. *Introduction to Business Data Processing.* New York: McGraw-Hill Book Company, 1979.

G. Merchant. *Applied FORTRAN Programming with Standard FORTRAN, WATFOR, WATFIVE, and Structured WATFIVE.* Wadsworth Publications, 1977.

H. Robichaud, Beryl, Eugene Muscat, and Alix-Marie Hall. *Introduction to Data Processing.* New York: McGraw-Hill Book Company, 1977.

I. Casady, Mona. *Word Processing Concepts.* Cincinnati: South-Western Publishing Co., 1980.

UNDERSTANDING PROGRAMMING CONCEPTS AND COMPUTER LANGUAGE
UNIT VII

INFORMATION SHEET

I. Terms and definitions

A. Machine language--A programming language that can be interpreted directly by the internal circuitry of the computer

B. Code--To translate and write information in a programming language

C. Assembler language--A symbolic programming language that uses symbols and abbreviations to represent the function to be performed

D. Input/output symbol--Represents an input or output operation

(NOTE: Input/output is also known as I/O.)

E. Assembler--A computer program used to translate a program written in a symbolic programming language into a machine language program

F. Punch card deck symbol--Represents punched card file

G. PL/1--A high-level programming language developed by IBM for use as a general purpose language in both business and scientific applications

H. Deck checking--Visually inspecting a program and tracing its logic to eliminate errors before submitting the program to the computer

(NOTE: Deck checking is also known as visual checking.)

I. FORTRAN--A high-level programming language designed for scientists, mathematicians, and engineers

J. Document symbol--Represents paper documents and reports of all varieties

K. Low-level programming language--Programming language which is closely related to a particular machine

L. Flow direction--Indicates the path of logical flow in a program

M. Decision symbol--Indicates that a decision must be made at this point

N. Programming languages--Languages used in writing programs to direct processing steps carried out by a computer

O. Program flowchart--A detailed pictorial representation of the steps necessary to solve a problem

P. Debugging--Task of detecting, locating, and eliminating mistakes in a program

Q. Flowlines--Indicate the direction of processing or flow of data

INFORMATION SHEET

R. High-level programming languages--A class of programming languages which are generally machine-independent, i.e., do not necessitate a high degree of knowledge of the machine compiler or generator language

(NOTE: They must be used by a compiler to convert to machine language.)

S. Housekeeping--Operations of a program or system that do not contribute directly to the solution of a problem but are necessary processing functions, such as checking labels

T. RPG--A high-level programming language designed to provide an easy method of generating routine business reports

U. Magnetic tape symbol--Represents magnetic tape file

V. Interpreter--A program that reads source statements and immediately causes the statements to be executed one at a time

W. Connector symbol--Connects separated portions of a flowchart without drawing lines between the parts

X. BASIC--A programming language developed at Dartmouth College for use in academic computing, but now widely used on personal computers and small business systems

Y. Terminal symbol--Represents the beginning, end, or point of interruption in a program

Z. Compiler--A computer program used to translate high-level source language programs into machine language programs suitable for execution on a particular computing system

AA. Data format--The form in which data is to appear in a computer printout

BB. Testing--Running of a program or system of programs against representative data to insure the adequacy of the program or system for regular use

CC. Program--Step-by-step process described in terms of instructions a computer can follow

DD. Logical errors--Errors which occur when the programmer does not thoroughly understand a phase of the problem, fails to account for all situations that may arise during processing, or misinterprets some steps when coding

EE. Diagnostics--Computer-generated error messages that identify mistakes in coding

FF. Processing symbol--Indicates a change in the form or value of data will occur, or that an operation or process is to be performed

INFORMATION SHEET

GG. Documentation--The illustrations and explanations that should accompany the computer printout of a "working" program that include both general information needed by the user of the program and the specific information needed by the computer operator or by the computer programmer if the program later needs updating

HH. System flowchart--A series of symbols designed to show the data flow and operational sequence of a system

II. COBOL--A high-level programming language designed to handle the data processing needs of business

JJ. Display symbol--Represents information displayed by on-line printer keyboards, or visual-display units

KK. Flowcharting template--Plastic or metallic card containing both system and program flowcharting symbols as cutout forms

LL. Clerical errors--Errors which occur in the coding of the program or when entering the coded program on some input device

MM. Source program--Initial program fed into the computer

NN. Object program--Source program converted to machine language

OO. Source language--Language used in COBAL, PL/1, BASIC, for example

II. The program development process

A. Define the problem

1. Recognize the need for information

2. Analyze the need for information

(NOTE: The analysis process should involve both the prospective user(s) of the information and trained systems designers.)

3. Outline the needed information

(NOTE: This also includes the physical layout of how the output would appear.)

4. State the problem

5. Prepare a system flowchart (Transparencies 1 and 2)

a. Emphasize media used and work stations through which data passes

(NOTE: Little is shown about how processing is to be accomplished.)

b. Utilize system flowcharting symbols

INFORMATION SHEET

B. Plan the solution (Transparency 3)

   1. Determine processing step sequence

      (NOTE: Consider such items as storage requirements, data formats, and housekeeping procedures.)

   2. Prepare program flowchart

      a. Show in detail processing steps and order of execution

      b. Use program flowchart symbols

         (NOTE: A flowcharting template is used in preparing system and program flowcharts.)

C. Code the solution

   1. A programming language is used in coding

   2. The program flowchart serves as a guide

D. Debug

   1. Types of programming errors

      a. Clerical

      b. Logical

   2. Methods of debugging

      a. Deck checking

         (NOTE: This method prevents needless waste of computer time.)

      b. Diagnostics

E. Test

   1. This step verifies that a program will consistently produce correct results

   2. Both valid and invalid data submitted as input

   3. Expected results determined before input

      (NOTE: This allows for the validity of the information produced from the computer to be checked.)

INFORMATION SHEET

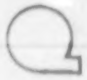
F. Document

(NOTE: This process is extremely valuable when the program is to be rewritten for another computer or when some other programmer is to modify the program.)

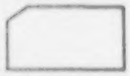
Examples: An English language description of the problem
A flowchart
A symbolic listing of the program
A list of instructions needed to operate the program
Description of files and record layouts
Test cases and sample results
A list of error conditions

III. System flowcharting descriptons and their symbols

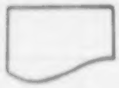
A. Magnetic tape symbol--



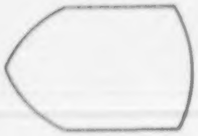
B. Punched card deck symbol--



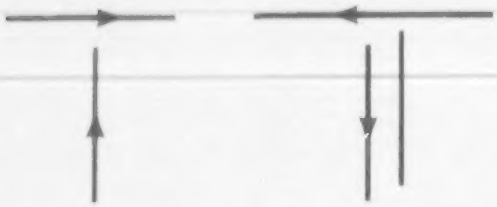
C. Document symbol--



D. Display symbol--

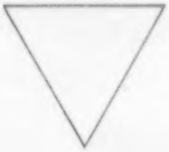


E. Flowlines--

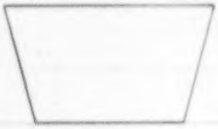


INFORMATION SHEET

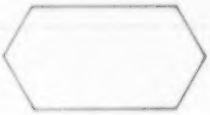
F. Storage--



G. Manual operation or activity--

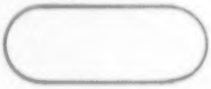


H. Conversion from tape to card or vice-versa--

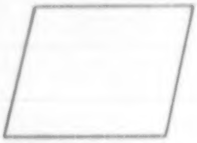


IV. Basic program flowcharting descriptions and their symbols

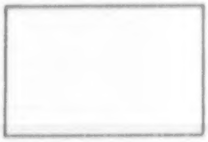
A. Terminal symbol--



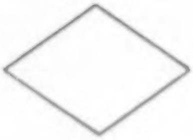
B. Input/output symbol--



C. Processing symbol--

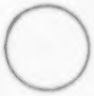


D. Decision symbol--

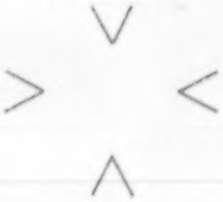


INFORMATION SHEET

E. Connector symbol--



F. Flow direction--



V. Descriptions of primary programming languages

A. Machine language (Figure 1)

1. Low-level programming language
2. Can be directly interpreted by a computer
3. Uses codes of 1's and 0's
4. Tedious and time-consuming

Machine language coding form			
Oper	OP 1	OP 2	Comments
100010	000 000 000 000 011	010 110 100 000 000	Load register with C
001100	000 000 000 000 011	011 010 000 000 000	Multiply by B
011100	000 000 000 000 011	010 101 011 000 000	Add A
010111	000 000 000 000 011	100 001 000 000 000	Store as D

Figure 1

Machine Language Program to
Compute d = a + b x c

Used by permission of Charles E. Merrill Publishing Company from *Data Processing: An Introduction* by Donald Spencer.

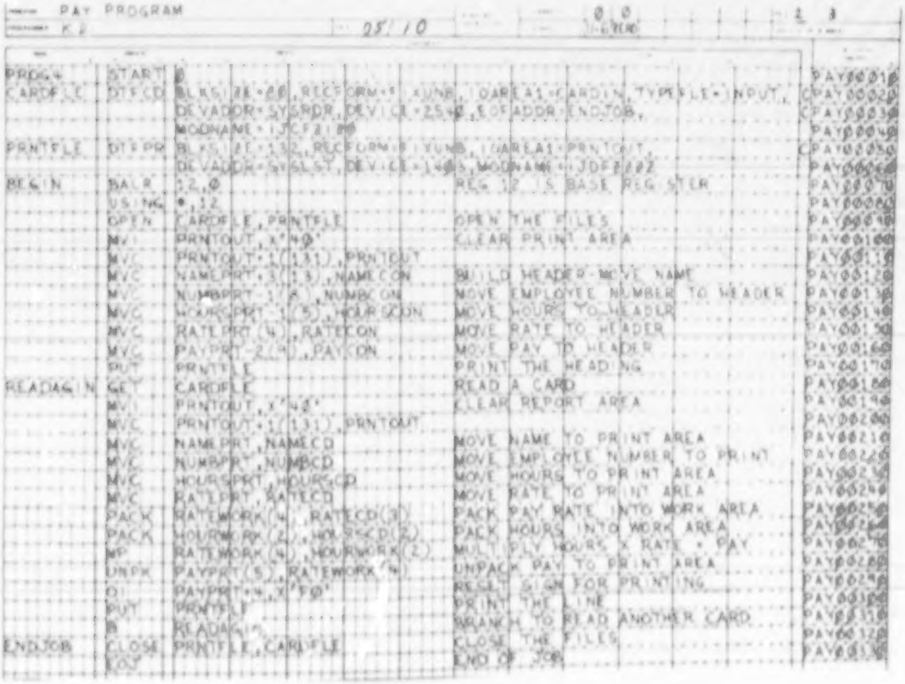
B. Assembler language (Figure 2)

1. Low-level symbolic language
2. One assembler language available for use with each type of computer

INFORMATION SHEET

3. Similar to machine language but uses symbolic names rather than numerical representations of operations

4. Processed by an assembler



```
PAY PROGRAM                              25/10

PROG4    START 0                                                        PAY00010
CARDFLE  DTFCD BLKSIZE=80,RECFORM=FIXUNB,IOAREA1=CARDIN,TYPEFLE=INPUT,  CPAY00020
               DEVADDR=SYSRDR,DEVICE=2540,EOFADDR=ENDJOB,               CPAY00030
               MODNAME=IJCFZIZ0                                          PAY00040
PRNTFLE  DTFPR BLKSIZE=132,RECFORM=FIXUNB,IOAREA1=PRNTOUT,              CPAY00050
               DEVADDR=SYSLST,DEVICE=1403,MODNAME=IJDFZZZZ               PAY00060
BEGIN    BALR  12,0                  REG 12 IS BASE REGISTER             PAY00070
         USING *,12                                                      PAY00080
         OPEN  CARDFLE,PRNTFLE       OPEN THE FILES                      PAY00090
         MVI   PRNTOUT,X'40'         CLEAR PRINT AREA                    PAY00100
         MVC   PRNTOUT+1(131),PRNTOUT                                    PAY00110
         MVC   NAMEPRT+3(13),NAMECON BUILD HEADER-MOVE NAME              PAY00120
         MVC   NUMBPRT-1(6),NUMBCON  MOVE EMPLOYEE NUMBER TO HEADER      PAY00130
         MVC   HOURSPRT-1(5),HOURSCON MOVE HOURS TO HEADER               PAY00140
         MVC   RATEPRT(4),RATECON    MOVE RATE TO HEADER                 PAY00150
         MVC   PAYPRT-2(4),PAYCON    MOVE PAY TO HEADER                  PAY00160
         PUT   PRNTFLE               PRINT THE HEADING                   PAY00170
READAGIN GET   CARDFLE               READ A CARD                         PAY00180
         MVI   PRNTOUT,X'40'         CLEAR REPORT AREA                   PAY00190
         MVC   PRNTOUT+1(131),PRNTOUT                                    PAY00200
         MVC   NAMEPRT,NAMECD        MOVE NAME TO PRINT AREA             PAY00210
         MVC   NUMBPRT,NUMBCD        MOVE EMPLOYEE NUMBER TO PRINT       PAY00220
         MVC   HOURSPRT,HOURSCD      MOVE HOURS TO PRINT AREA            PAY00230
         MVC   RATEPRT,RATECD        MOVE RATE TO PRINT AREA             PAY00240
         PACK  RATEWORK(4),RATECD(3) PACK PAY RATE INTO WORK AREA        PAY00250
         PACK  HOURWORK(2),HOURSCD(2) PACK HOURS INTO WORK AREA          PAY00260
         MP    RATEWORK(4),HOURWORK(2) MULTIPLY HOURS X RATE = PAY       PAY00270
         UNPK  PAYPRT(5),RATEWORK(4) UNPACK PAY TO PRINT AREA            PAY00280
         OI    PAYPRT+4,X'F0'        RESET SIGN FOR PRINTING             PAY00290
         PUT   PRNTFLE               PRINT THE LINE                      PAY00300
         B     READAGIN              BRANCH TO READ ANOTHER CARD         PAY00310
ENDJOB   CLOSE PRNTFLE,CARDFLE       CLOSE THE FILES                     PAY00320
         EOJ                         END OF JOB                          PAY00330
```

Figure 2 Assembler Language Program

C. FORTRAN (Figure 3)

1. FORmula TRANslator

2. A scientific-mathematical language (a high level language)

3. Basic elements of FORTRAN program statements

   a. Assignment

      1) Perform some arithmetic or logical operation

      2) Store result in a location identified by a variable name

   b. Input/output

      1) Read data from an input device

      2) Write information with an output device

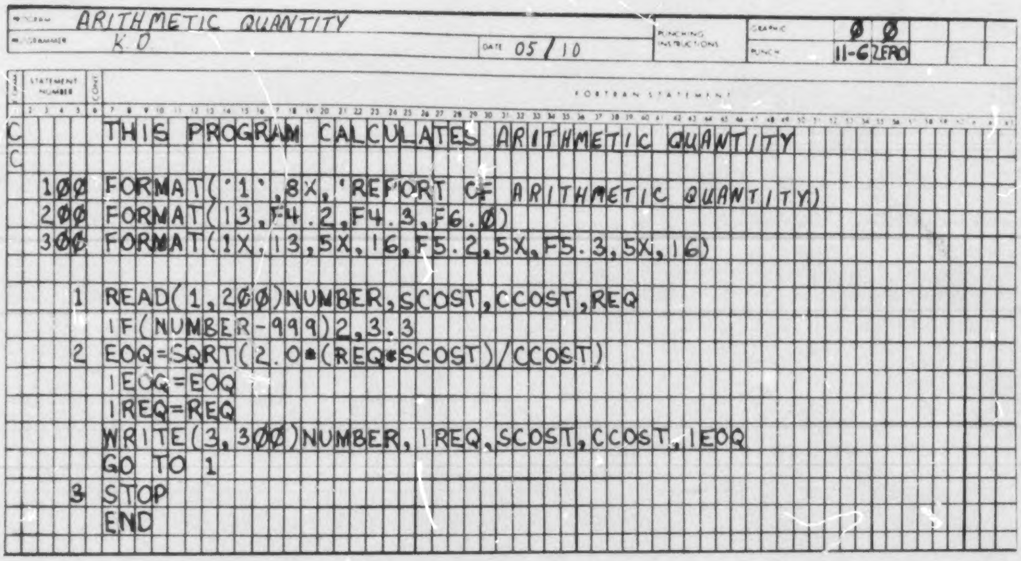
INFORMATION SHEET

c. Specification--Describe the data being transferred to or from an output device

d. Control--Direct the flow of control through a program

Figure 3

FORTRAN Program



PROGRAM ARITHMETIC QUANTITY
PROGRAMMER K O
DATE 05/10
PUNCHING INSTRUCTIONS
GRAPHIC 0 0
PUNCH 11-6 ZERO

```
C    THIS PROGRAM CALCULATES ARITHMETIC QUANTITY
C
  100 FORMAT('1',8X,'REPORT OF ARITHMETIC QUANTITY)
  200 FORMAT(I3,F4.2,F4.3,F6.0)
  300 FORMAT(1X,I3,5X,I6,F5.2,5X,F5.3,5X,I6)

    1 READ(1,200)NUMBER,SCOST,CCOST,REQ
      IF(NUMBER-999)2,3.3
    2 EOQ=SQRT(2.0*(REQ*SCOST)/CCOST)
      IEOQ=EOQ
      IREQ=REQ
      WRITE(3,300)NUMBER,IREQ,SCOST,CCOST,IEOQ
      GO TO 1
    3 STOP
      END
```

D. COBOL (Transparencies 4 and 5)

1. COmmon Business-Oriented Language

2. High-level language

3. Most widely used for business applications

4. Statements written in English

   Examples: Read, write, if, add, subtract, multiply, divide, open, close, move

INFORMATION SHEET

5. Divisions of a COBOL program

   a. Identification division

      1) Program

      2) Author

      3) Location

      4) Date

      5) Security classification

   b. Environment division

      1) Type of computer

      2) Input/output devices

      (NOTE: This is the only division which must be changed when a COBOL program is to run on different computer systems.)

   c. Data division

      1) File section

      2) Working storage section

      (NOTE: Because data is described separately from instructions, it is easier to change or modify after program has been written.)

   d. Procedure division

      1) Contains instructions which are executed by computer

      2) Indicates the order in which the computer is to perform instructions

E. PL/1 (Transparency 6)

1. Programming Language One

2. High-level language

3. Serves both scientific and business users

4. Combines some of the computational concepts of FORTRAN with some of the file processing capabilities of COBOL

   (NOTE: Although this language is used in the computer community, it has never achieved the success anticipated by its developer.)

INFORMATION SHEET

F. RPG (Transparency 7)

1. Report Program Generator
2. Simplified language for small-scale business users

   (NOTE: This is a high-level language.)
3. Routine business reports generated quickly and easily
4. Specifications of an RPG program
   a. File description
      1) Identifies each file as input and/or output
      2) Associates file with an I/O device
   b. Input
      1) Describes types of records in each input file
      2) Indicates locations of specific data fields in the file
   c. Calculation
      1) Specifies operations to be performed
      2) Specifies data to be used
      3) Specifies characteristics of results
      4) Specifies tests to be made on results
   d. Output
      1) Identifies information for output
      2) Describes its location on a data recording medium
   e. File extension--Provides additional information when chaining, tabling, or using direct access files
   f. Line counter--Specifies line control when information is written to tape or disk for subsequent printing

INFORMATION SHEET

G. BASIC (Transparency 8)

1. Beginners All-purpose Symbolic Instruction Code
2. Primarily used with microcomputers and small business computers
3. Designed for interactive computing
4. High-level language

   (NOTE: The BASIC was developed at Dartmouth College in the 1960's for use in the academic environment.)

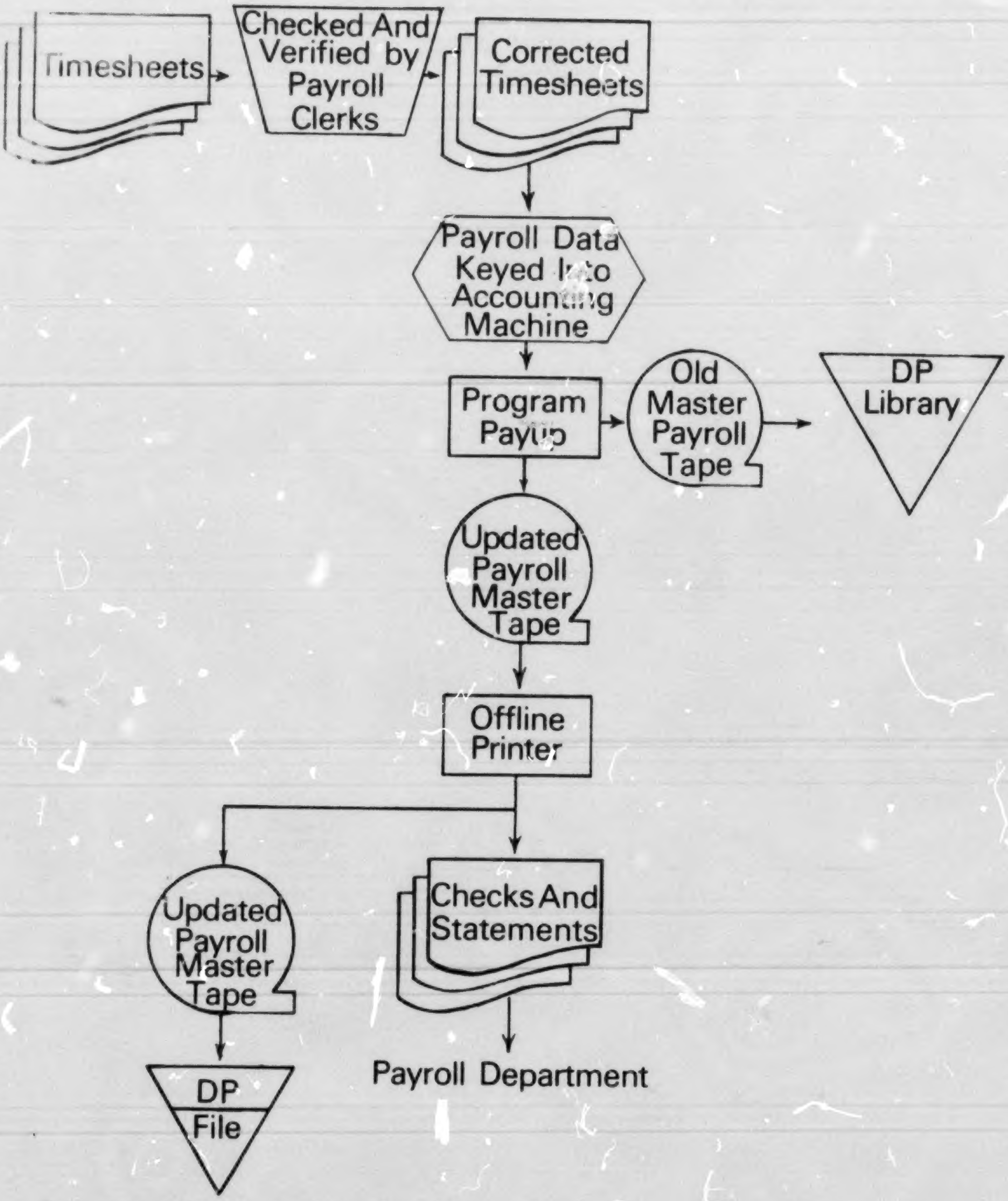
5. Applications
   a. Educational
   b. Engineering
   c. Mathematical
   d. Statistical
   e. Business

   (NOTE: Because of the many incompatabilities between BASIC compilers and interpreters, a BASIC program written for one computer will not necessarily run on another computer.)

6. Statements
   a. INPUT--Allows interactive entry of data from a terminal
   b. READ and DATA--Reads input values built into the program
   c. IF. . .THEN--Allows for conditional branching based on the existence of a predefined condition
   d. FOR and NEXT--Controls looping through a sequence of statements
   e. GOSUB and RETURN--Transfers to a particular statement and then, after executing one or more statements, transfers back to the original sequence
   f. PRINT--Causes output to be printed or displayed on a terminal

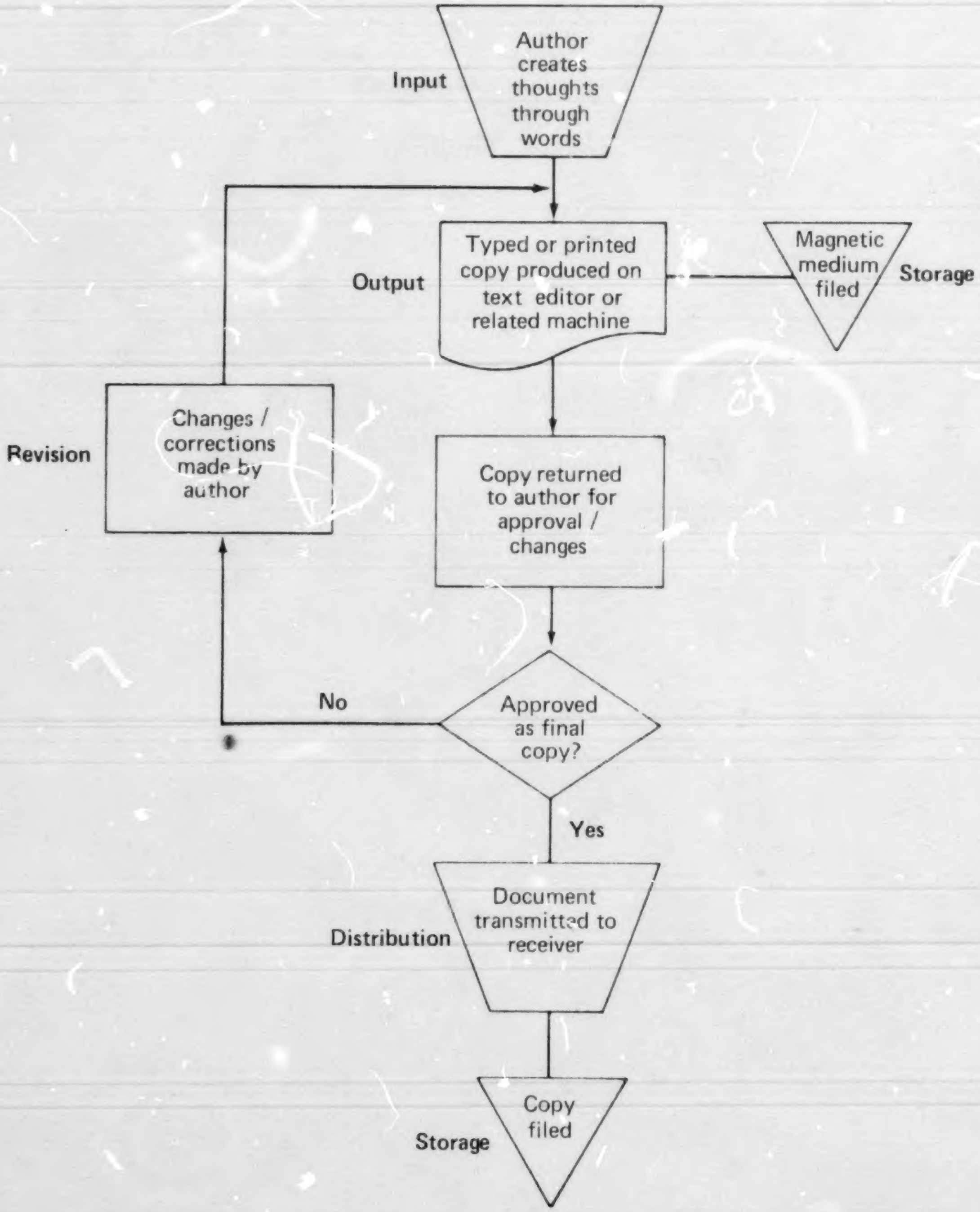
   (NOTE: These are the most commonly used statements in BASIC.)

System Flowchart of Data Processing Cycle

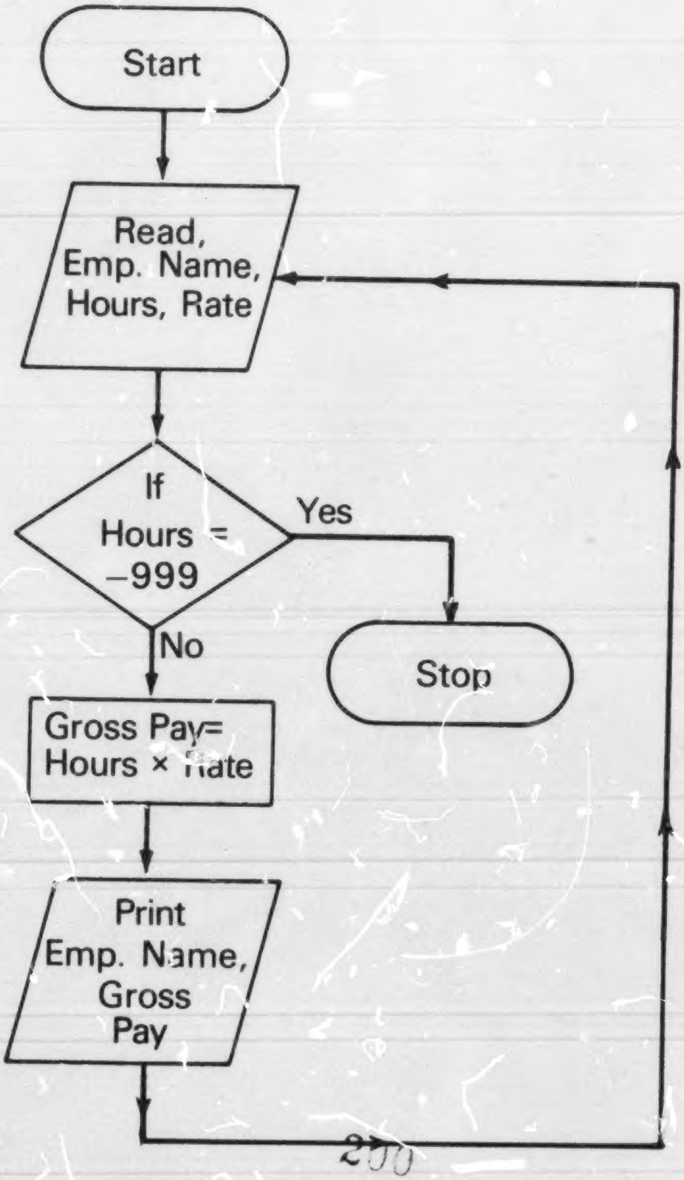

Timesheets
Checked And Verified by Payroll Clerks
Corrected Timesheets
Payroll Data Keyed Into Accounting Machine
Program Payup
Old Master Payroll Tape
DP Library
Updated Payroll Master Tape
Offline Printer
Updated Payroll Master Tape
Checks And Statements
DP File
Payroll Department

From *Introduction to Business Data Processing* by Lawrence S. Orilia. Copyright 1979 by McGraw-Hill, Inc. Used with permission of McGraw-Hill Book Company.

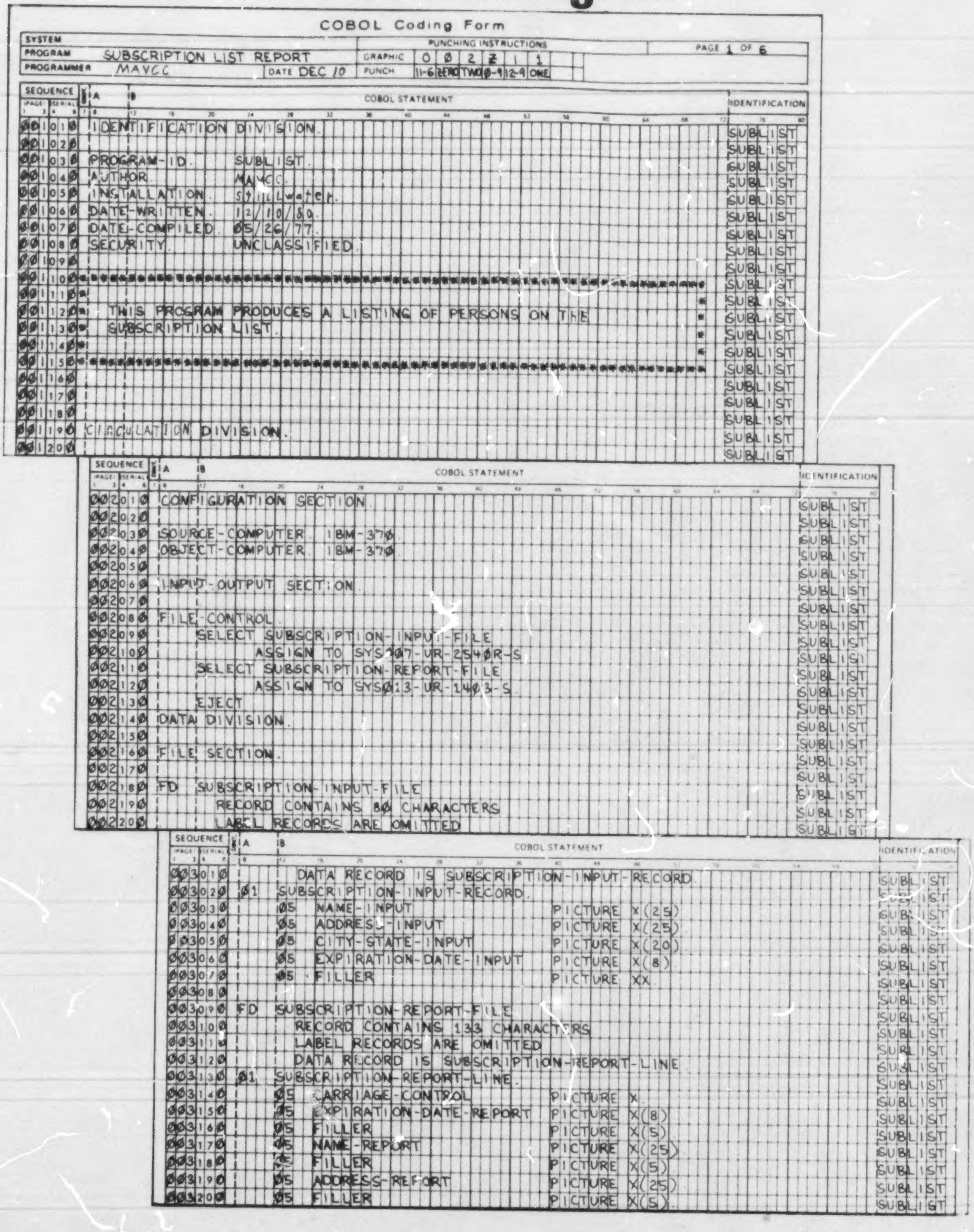
System Flowchart of Word Processing Cycle


Input
Author creates thoughts through words
Output
Typed or printed copy produced on text editor or related machine
Magnetic medium filed
Storage
Revision
Changes / corrections made by author
Copy returned to author for approval / changes
No
Approved as final copy?
Yes
Distribution
Document transmitted to receiver
Storage
Copy filed

Sample Program Flowchart


Start
Read, Emp. Name, Hours, Rate
If Hours = –999
Yes
No
Stop
Gross Pay= Hours × Rate
Print Emp. Name, Gross Pay

A COBOL Program



COBOL Coding Form

SYSTEM			
PROGRAM	SUBSCRIPTION LIST REPORT		
PROGRAMMER	MAVCC	DATE DEC 10	

PUNCHING INSTRUCTIONS						
GRAPHIC	O	Ø	2	Z	I	1
PUNCH	11-6	ZERO	TWO	0-9	12-9	ONE

PAGE 1 OF 6

SEQUENCE (PAGE) (SERIAL) | A | B | COBOL STATEMENT | IDENTIFICATION

```
001010 IDENTIFICATION DIVISION.                                         SUBLIST
001020                                                                  SUBLIST
001030 PROGRAM-ID.     SUBLIST.                                         SUBLIST
001040 AUTHOR.         MAVCC.                                           SUBLIST
001050 INSTALLATION.   stillwater.                                      SUBLIST
001060 DATE-WRITTEN.   12/10/80.                                        SUBLIST
001070 DATE-COMPILED.  05/26/77.                                        SUBLIST
001080 SECURITY.       UNCLASSIFIED.                                    SUBLIST
001090                                                                  SUBLIST
001100******************************************************************SUBLIST
001110*                                                                *SUBLIST
001120*  THIS PROGRAM PRODUCES A LISTING OF PERSONS ON THE             *SUBLIST
001130*  SUBSCRIPTION LIST.                                            *SUBLIST
001140*                                                                *SUBLIST
001150******************************************************************SUBLIST
001160                                                                  SUBLIST
001170                                                                  SUBLIST
001180                                                                  SUBLIST
001190 CIRCULATION DIVISION.                                            SUBLIST
001200                                                                  SUBLIST
```

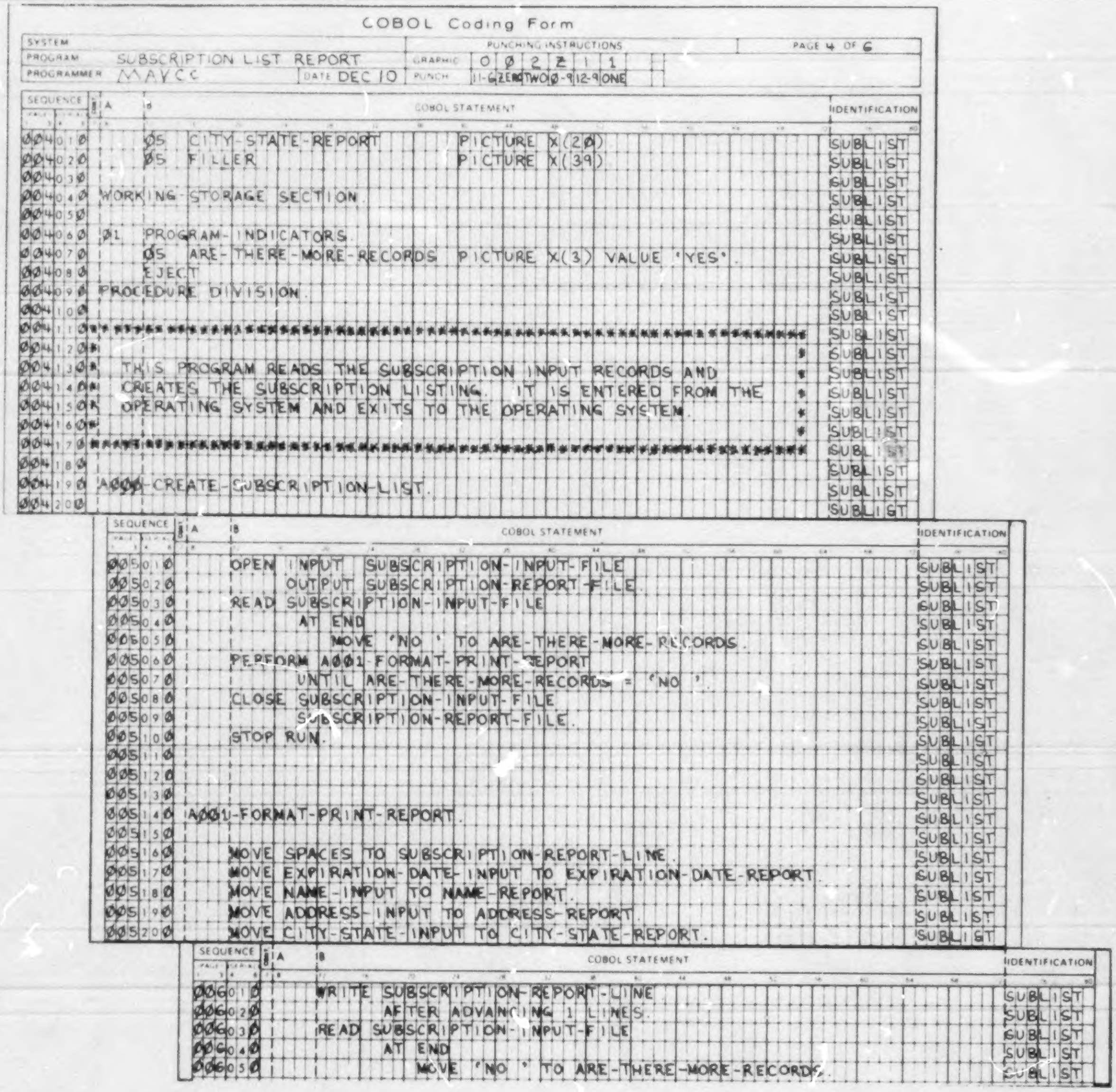
SEQUENCE (PAGE) (SERIAL) | A | B | COBOL STATEMENT | IDENTIFICATION

```
002010 CONFIGURATION SECTION.                                           SUBLIST
002020                                                                  SUBLIST
002030 SOURCE-COMPUTER.  IBM-370.                                       SUBLIST
002040 OBJECT-COMPUTER.  IBM-370.                                       SUBLIST
002050                                                                  SUBLIST
002060 INPUT-OUTPUT SECTION.                                            SUBLIST
002070                                                                  SUBLIST
002080 FILE-CONTROL.                                                    SUBLIST
002090     SELECT SUBSCRIPTION-INPUT-FILE                               SUBLIST
002100             ASSIGN TO SYS007-UR-2540R-S                          SUBLIST
002110     SELECT SUBSCRIPTION-REPORT-FILE                              SUBLIST
002120             ASSIGN TO SYS013-UR-1403-S.                          SUBLIST
002130     EJECT                                                        SUBLIST
002140 DATA DIVISION.                                                   SUBLIST
002150                                                                  SUBLIST
002160 FILE SECTION.                                                    SUBLIST
002170                                                                  SUBLIST
002180 FD  SUBSCRIPTION-INPUT-FILE                                      SUBLIST
002190         RECORD CONTAINS 80 CHARACTERS                            SUBLIST
002200         LABEL RECORDS ARE OMITTED                                SUBLIST
```

SEQUENCE (PAGE) (SERIAL) | A | B | COBOL STATEMENT | IDENTIFICATION

```
003010         DATA RECORD IS SUBSCRIPTION-INPUT-RECORD.                SUBLIST
003020 01  SUBSCRIPTION-INPUT-RECORD.                                   SUBLIST
003030     05  NAME-INPUT              PICTURE X(25).                   SUBLIST
003040     05  ADDRESS-INPUT           PICTURE X(25).                   SUBLIST
003050     05  CITY-STATE-INPUT        PICTURE X(20).                   SUBLIST
003060     05  EXPIRATION-DATE-INPUT   PICTURE X(8).                    SUBLIST
003070     05  FILLER                  PICTURE XX.                      SUBLIST
003080                                                                  SUBLIST
003090 FD  SUBSCRIPTION-REPORT-FILE                                     SUBLIST
003100         RECORD CONTAINS 133 CHARACTERS                           SUBLIST
003110         LABEL RECORDS ARE OMITTED                                SUBLIST
003120         DATA RECORD IS SUBSCRIPTION-REPORT-LINE.                 SUBLIST
003130 01  SUBSCRIPTION-REPORT-LINE.                                    SUBLIST
003140     05  CARRIAGE-CONTROL        PICTURE X.                       SUBLIST
003150     05  EXPIRATION-DATE-REPORT  PICTURE X(8).                    SUBLIST
003160     05  FILLER                  PICTURE X(5).                    SUBLIST
003170     05  NAME-REPORT             PICTURE X(25).                   SUBLIST
003180     05  FILLER                  PICTURE X(5).                    SUBLIST
003190     05  ADDRESS-REPORT          PICTURE X(25).                   SUBLIST
003200     05  FILLER                  PICTURE X(5).                    SUBLIST
```

A COBOL Program (Continued)



COBOL Coding Form

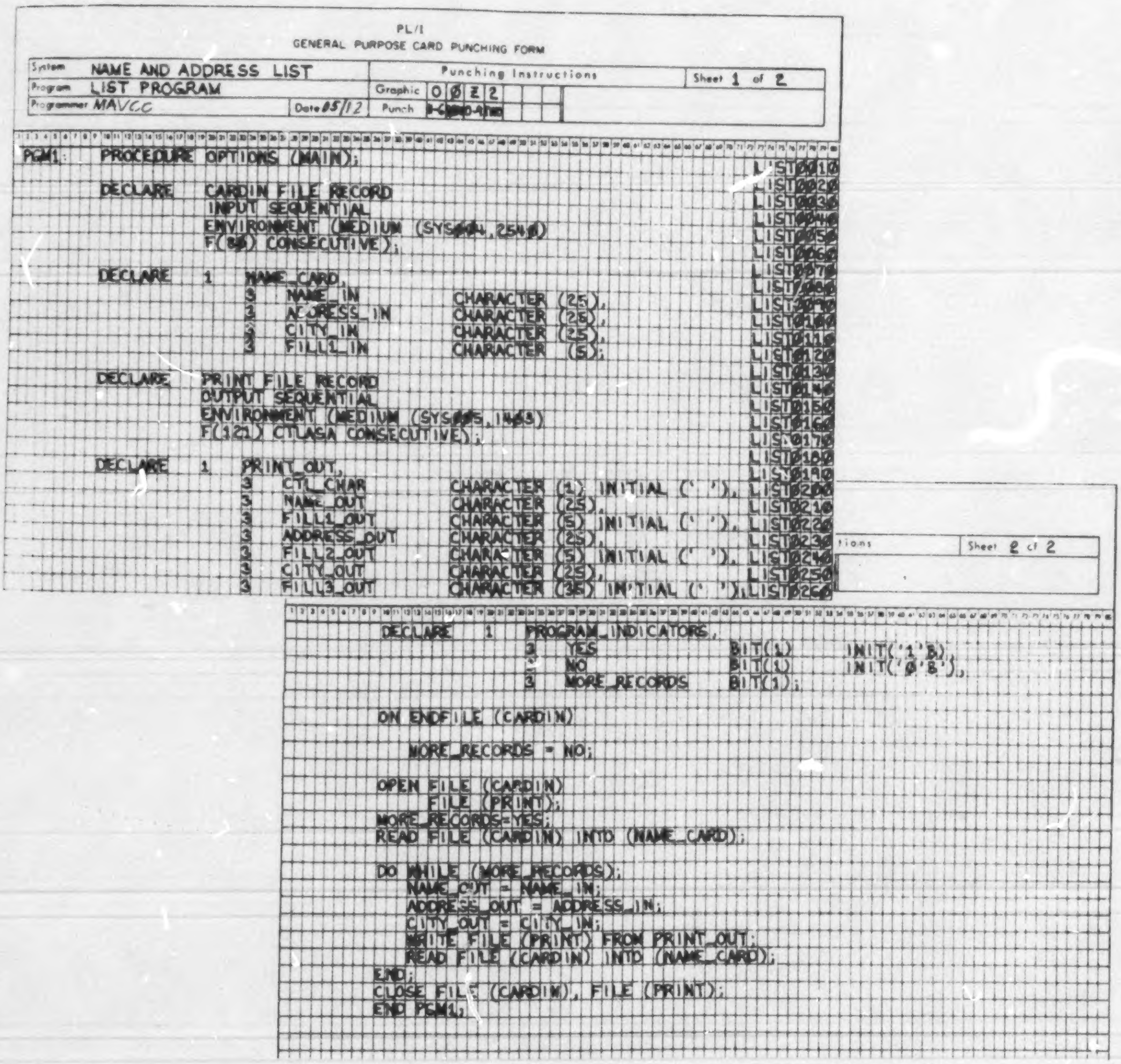
SYSTEM
PROGRAM SUBSCRIPTION LIST REPORT
PROGRAMMER MAYCC DATE DEC 10
PUNCHING INSTRUCTIONS
GRAPHIC 0 | Ø | 2 | Z | I | 1
PUNCH 11-6 | ZERO | TWO | 0-9 | 12-9 | ONE
PAGE 4 OF 6

```
004010     05  CITY-STATE-REPORT       PICTURE X(20).                   SUBLIST
004020     05  FILLER                  PICTURE X(39).                   SUBLIST
004030                                                                  SUBLIST
004040 WORKING-STORAGE SECTION.                                         SUBLIST
004050                                                                  SUBLIST
004060 01  PROGRAM-INDICATORS.                                          SUBLIST
004070     05  ARE-THERE-MORE-RECORDS  PICTURE X(3) VALUE 'YES'.        SUBLIST
004080     EJECT                                                        SUBLIST
004090 PROCEDURE DIVISION.                                              SUBLIST
004100                                                                  SUBLIST
004110******************************************************************SUBLIST
004120*                                                                *SUBLIST
004130*  THIS PROGRAM READS THE SUBSCRIPTION INPUT RECORDS AND         *SUBLIST
004140*  CREATES THE SUBSCRIPTION LISTING.  IT IS ENTERED FROM THE     *SUBLIST
004150*  OPERATING SYSTEM AND EXITS TO THE OPERATING SYSTEM.           *SUBLIST
004160*                                                                *SUBLIST
004170******************************************************************SUBLIST
004180                                                                  SUBLIST
004190 A000-CREATE-SUBSCRIPTION-LIST.                                   SUBLIST
004200                                                                  SUBLIST
```

```
005010     OPEN INPUT   SUBSCRIPTION-INPUT-FILE                         SUBLIST
005020           OUTPUT SUBSCRIPTION-REPORT-FILE.                       SUBLIST
005030     READ SUBSCRIPTION-INPUT-FILE                                 SUBLIST
005040             AT END                                               SUBLIST
005050                 MOVE 'NO ' TO ARE-THERE-MORE-RECORDS.            SUBLIST
005060     PERFORM A001-FORMAT-PRINT-REPORT                             SUBLIST
005070             UNTIL ARE-THERE-MORE-RECORDS = 'NO '.                SUBLIST
005080     CLOSE SUBSCRIPTION-INPUT-FILE                                SUBLIST
005090           SUBSCRIPTION-REPORT-FILE.                              SUBLIST
005100     STOP RUN.                                                    SUBLIST
005110                                                                  SUBLIST
005120                                                                  SUBLIST
005130                                                                  SUBLIST
005140 A001-FORMAT-PRINT-REPORT.                                        SUBLIST
005150                                                                  SUBLIST
005160     MOVE SPACES TO SUBSCRIPTION-REPORT-LINE.                     SUBLIST
005170     MOVE EXPIRATION-DATE-INPUT TO EXPIRATION-DATE-REPORT.        SUBLIST
005180     MOVE NAME-INPUT TO NAME-REPORT.                              SUBLIST
005190     MOVE ADDRESS-INPUT TO ADDRESS-REPORT.                        SUBLIST
005200     MOVE CITY-STATE-INPUT TO CITY-STATE-REPORT.                  SUBLIST
```

```
006010     WRITE SUBSCRIPTION-REPORT-LINE                               SUBLIST
006020             AFTER ADVANCING 1 LINES.                             SUBLIST
006030     READ SUBSCRIPTION-INPUT-FILE                                 SUBLIST
006040             AT END                                               SUBLIST
006050                 MOVE 'NO ' TO ARE-THERE-MORE-RECORDS.            SUBLIST
```

A PL/I Program



PL/I
GENERAL PURPOSE CARD PUNCHING FORM

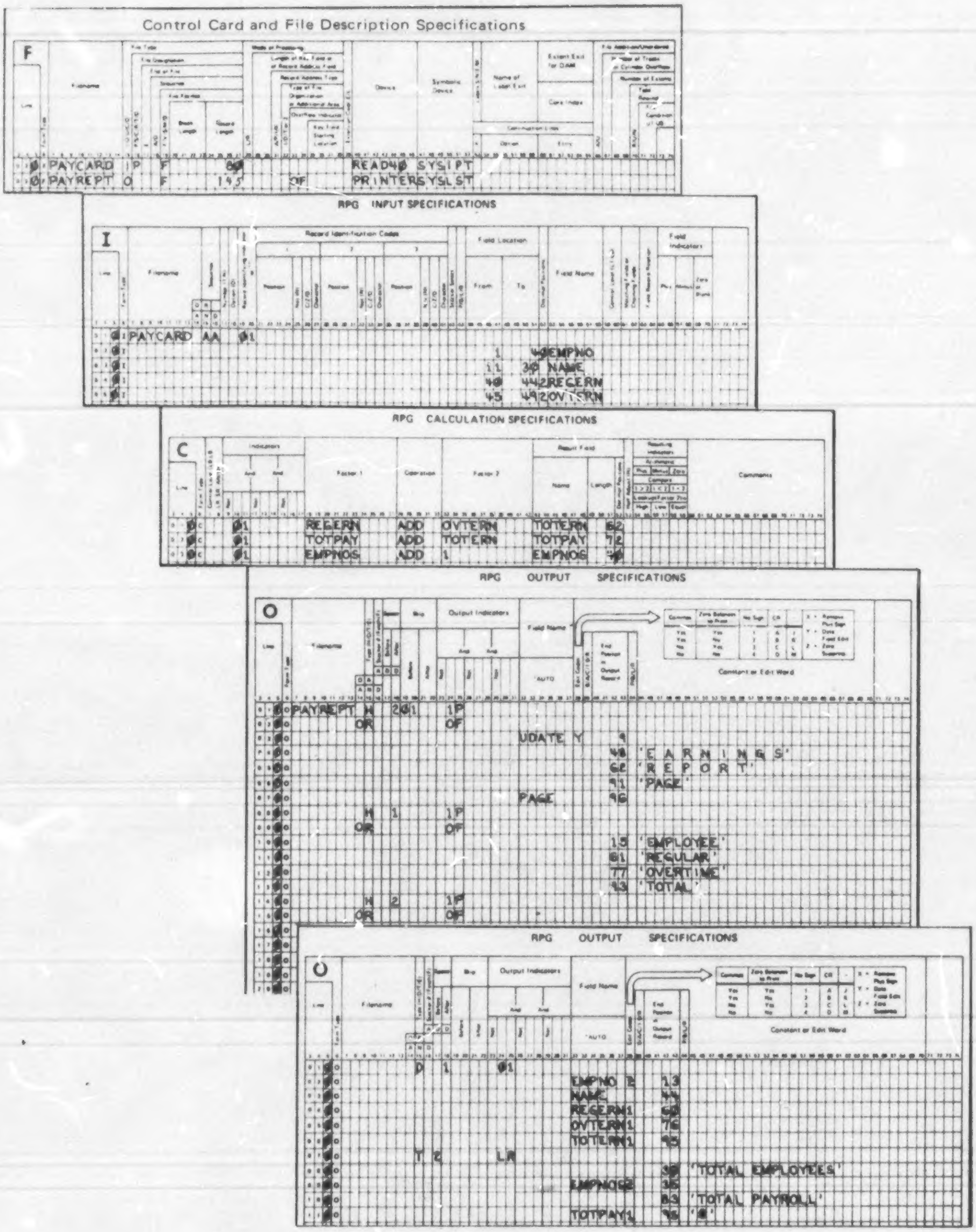
System NAME AND ADDRESS LIST		Punching Instructions	Sheet 1 of 2
Program LIST PROGRAM		Graphic O 0 Z 2	
Programmer MAVCC	Date 05/12	Punch	

```
PGM1:   PROCEDURE OPTIONS (MAIN);                                       LIST0010
                                                                        LIST0020
        DECLARE   CARDIN FILE RECORD                                    LIST0030
                  INPUT SEQUENTIAL                                      LIST0040
                  ENVIRONMENT (MEDIUM (SYS004,2540)                     LIST0050
                  F(80) CONSECUTIVE);                                   LIST0060
                                                                        LIST0070
        DECLARE   1    NAME_CARD,                                       LIST0080
                       3    NAME_IN           CHARACTER (25),           LIST0090
                       3    ADDRESS_IN        CHARACTER (25),           LIST0100
                       3    CITY_IN           CHARACTER (25),           LIST0110
                       3    FILL1_IN          CHARACTER  (5);           LIST0120
                                                                        LIST0130
        DECLARE   PRINT FILE RECORD                                     LIST0140
                  OUTPUT SEQUENTIAL                                     LIST0150
                  ENVIRONMENT (MEDIUM (SYS005,1403)                     LIST0160
                  F(121) CTLASA CONSECUTIVE);                           LIST0170
                                                                        LIST0180
        DECLARE   1    PRINT_OUT,                                       LIST0190
                       3    CTL_CHAR          CHARACTER (1) INITIAL (' '), LIST0200
                       3    NAME_OUT          CHARACTER (25),           LIST0210
                       3    FILL1_OUT         CHARACTER (5) INITIAL (' '), LIST0220
                       3    ADDRESS_OUT       CHARACTER (25),           LIST0230
                       3    FILL2_OUT         CHARACTER (5) INITIAL (' '), LIST0240
                       3    CITY_OUT          CHARACTER (25),           LIST0250
                       3    FILL3_OUT         CHARACTER (35) INITIAL (' '),LIST0260
```

tions | Sheet 2 of 2

```
        DECLARE   1    PROGRAM_INDICATORS,
                       3    YES               BIT(1)      INIT('1'B),
                       3    NO                BIT(1)      INIT('0'B),
                       3    MORE_RECORDS      BIT(1);

        ON ENDFILE (CARDIN)

           MORE_RECORDS = NO;

        OPEN FILE (CARDIN)
             FILE (PRINT);
        MORE_RECORDS=YES;
        READ FILE (CARDIN) INTO (NAME_CARD);

        DO WHILE (MORE_RECORDS);
           NAME_OUT = NAME_IN;
           ADDRESS_OUT = ADDRESS_IN;
           CITY_OUT = CITY_IN;
           WRITE FILE (PRINT) FROM PRINT_OUT;
           READ FILE (CARDIN) INTO (NAME_CARD);
        END;
        CLOSE FILE (CARDIN), FILE (PRINT);
        END PGM1;
```

An RPG Program



Control Card and File Description Specifications

```
F
0PAYCARD IP  F      80         READ40 SYSIPT
0PAYREPT O   F     145    OF   PRINTERSYSLST
```

RPG INPUT SPECIFICATIONS

```
I
0IPAYCARD AA  01
0I                                        1   40EMPNO
0I                                       11   30 NAME
0I                                       40   442REGERN
0I                                       45   492OVTERN
```

RPG CALCULATION SPECIFICATIONS

```
C
0C    01        REGERN    ADD  OVTERN    TOTERN  62
0C    01        TOTPAY    ADD  TOTERN    TOTPAY  72
0C    01        EMPNOS    ADD  1         EMPNOS  40
```

RPG OUTPUT SPECIFICATIONS

```
O
0OPAYREPT H  201   1P
0O       OR        OF
0O                         UDATE Y   9
0O                                  48 'E A R N I N G S'
0O                                  62 'R E P O R T'
0O                                  91 'PAGE'
0O                         PAGE     96
0O        H  1     1P
0O       OR        OF
0O                                  15 'EMPLOYEE'
0O                                  61 'REGULAR'
0O                                  77 'OVERTIME'
0O                                  93 'TOTAL'
0O        H  2     1P
0O       OR        OF
```

RPG OUTPUT SPECIFICATIONS

```
O
0O        D  1     01
0O                         EMPNO Z  13
0O                         NAME     44
0O                         REGERN1  60
0O                         OVTERN1  76
0O                         TOTERN1  95
0O        T  2     LR
0O                                  30 'TOTAL EMPLOYEES'
0O                         EMPNOSZ  35
0O                                  63 'TOTAL PAYROLL'
0O                         TOTPAY1  95 '$'
```

A BASIC Program

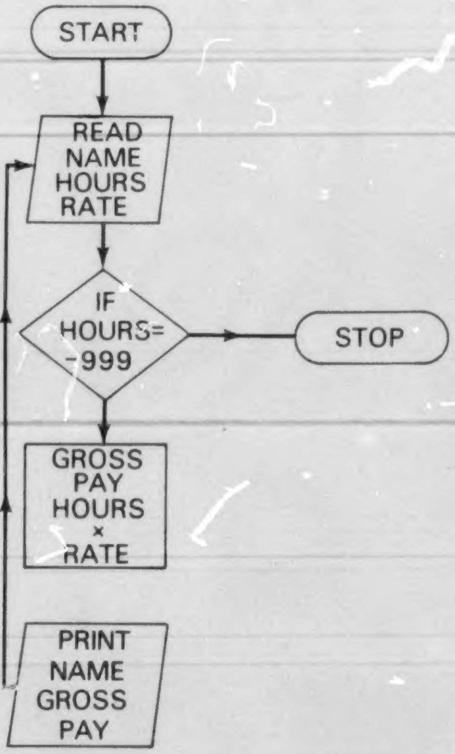
```
LIST

DEGREE      16:26      MAY 25, 1981

100 PRINT "FAHRENHEIT":
110 INPUT F
120 LET C = (F-32)*5/9
130 PRINT "CELSIUS:" C
140 PRINT
150 GO  TO 100
160 END

RUN

DEGREE 16:26  NOV. 21,1980

FAHRENHEIT? 32
CELSIUS: 0

FAHRENHEIT? 212
CELSIUS: 100

FAHRENHEIT? 98.6
CELSIUS :  37

FAHRENHEIT? 0
CELSIUS:  -17.7778

FAHRENHEIT? - 40
CELSIUS:  -40

FAHRENHEIT? STOP
STOP.
READY.
```

UNDERSTANDING PROGRAMMING CONCEPTS
AND COMPUTER LANGUAGE
UNIT VII

ASSIGNMENT SHEET #1--SOLVE A PROBLEM USING STEPS OUTLINED IN A FLOWCHART

Directions: Find the solution to the following flowchart below. Indicate in the blanks spaces below what information the computer would print if the following data was used:

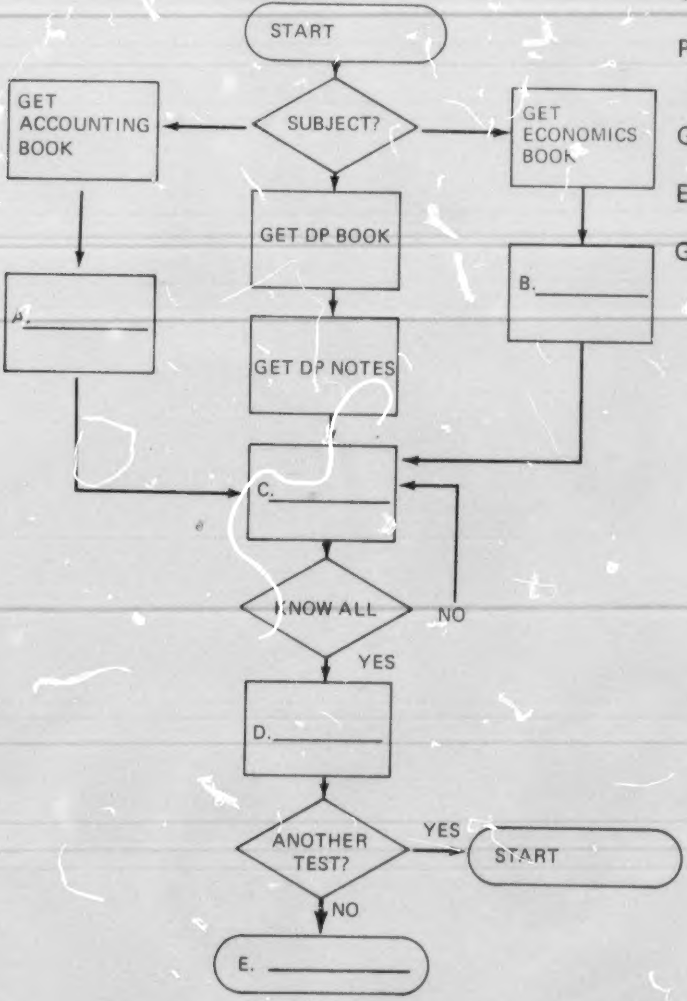
Name	Hours	Rate
Abbot	40	2.50
Brown	30	3.00
Coffy	35	4.00
Smith	-999	0.00


START
READ NAME HOURS RATE
IF HOURS= -999
STOP
GROSS PAY HOURS × RATE
PRINT NAME GROSS PAY

UNDERSTANDING PROGRAMMING CONCEPTS
AND COMPUTER LANGUAGE
UNIT VII

ASSIGNMENT SHEET #2--COMPLETE A SIMPLE PROGRAM FLOWCHART

Directions: Complete the blanks with the words on the right to show the procedure in studying for tests.


START
SUBJECT?
GET ACCOUNTING BOOK
GET DP BOOK
GET ECONOMICS BOOK
A. ____________
GET DP NOTES
B. ____________
C. ____________
KNOW ALL
NO
YES
D. ____________
ANOTHER TEST?
YES
START
NO
E. ____________

Cram

Put away study materials

Get accounting notes

End

Get economic notes

UNDERSTANDING PROGRAMMING CONCEPTS
AND COMPUTER LANGUAGE
UNIT VII

ASSIGNMENT SHEET #3--CONSTRUCT A SIMPLE PROGRAM FLOWCHART

Directions: Using appropriate program flowcharting symbols, construct a flowchart to read in six numbers into the computer, find the sum, and the average of these numbers. Refer to these six numbers as "A" each time in your flowchart. Use -999 as your check for the last number read. When the last number has been read into the computer, compute the average, print the average, and stop.

UNDERSTANDING PROGRAMMING CONCEPTS
AND COMPUTER LANGUAGE
UNIT VII

ANSWERS TO ASSIGNMENT SHEETS

Assignment Sheet #1

ABBOT	100.00
BROWN	90.00
COFFY	140.00

Assignment Sheet #2

a. Get accounting notes

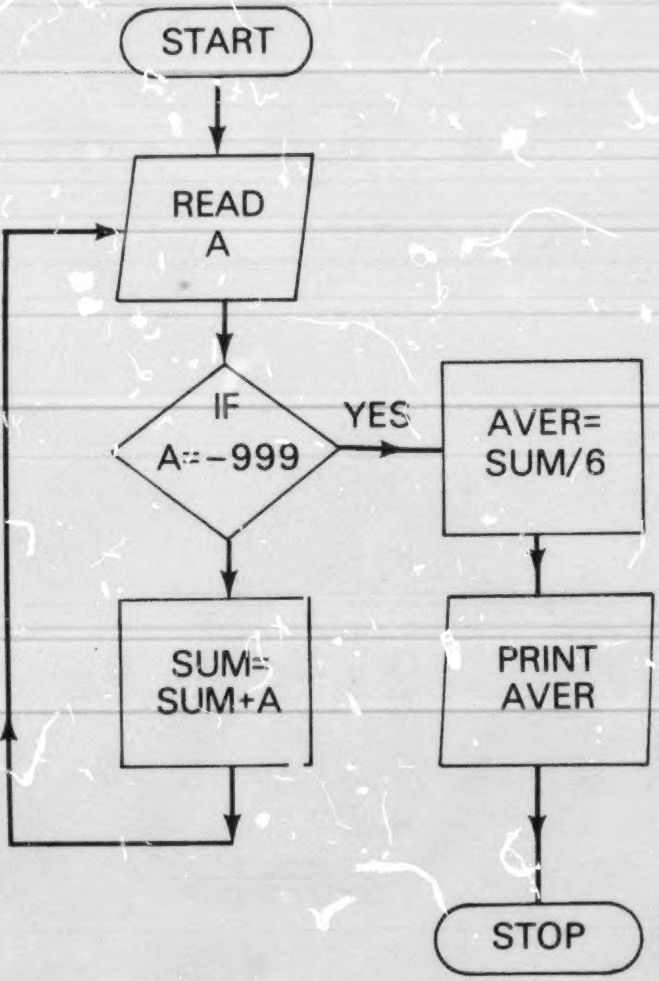
b. Get economic notes

c. Cram

d. Put away study materials

e. End

Assignment Sheet #3



START-- Each flowchart must have a terminal symbol "START" to show the beginning of the programs

Read A --Each time this symbol is executed, the next of the 6 numbers is read into the computer

IF A = -999-- This section is looking for the test data -999. When A becomes -999 then

AVER = SUM/6 --Sum is divided by 6 to get the average

If A is not -999, THEN

SUM = SUM + A --This box accumulates the totals of the six numbers to be added each time the loop is executed

At this point, you return to READ A and go through the whole process again

UNDERSTANDING PROGRAMMING CONCEPTS AND COMPUTER LANGUAGES
UNIT VII

NAME ____________________________

TEST

1. Match the terms on the right with the correct definitions.

(NOTE: Terms on each page will match definitions on each specific page.)

______ a. A programming language that can be interpreted directly by the internal circuitry of the computer

______ b. To translate and write information in a programming language

______ c. A symbolic programming language that uses symbols and abbreviations to represent the function to be performed

______ d. Represents an input or output operation

______ e. A computer program used to translate a program written in a symbolic programming language into a machine language program

______ f. Represents punched card file

______ g. A high-level programming language developed by IBM for use as a general purpose language in both business and scientific applications

______ h. Visually inspecting a program and tracing its logic to eliminate errors before submitting the program to the computer

______ i. A high-level programming language designed for scientists, mathematicians, and engineers

______ j. Represents paper documents and reports of all varieties

______ k. Programming language which is closely related to a particular machine

______ l. Indicates the path of logical flow in a program

______ m. Indicates that a decision must be made at this point

1. Assembler
2. Assembler language
3. FORTRAN
4. Machine language
5. PL/1
6. Code
7. Input/output symbol
8. Flow direction
9. Document symbol
10. Punch card deck symbol
11. Decision symbol
12. Deck checking
13. Low level programming language

______n. Languages used in writing programs to direct processing steps carried out by a computer

______o. A detailed pictorial representation of the steps necessary to solve a problem

______p. Task of detecting, locating, and eliminating mistakes in a program

______q. Indicate the direction of processing or flow of data

______r. A class of programming languages which are generally machine-independent, i.e., do not necessitate a high degree of knowledge of the machine compiler or generator language

______s. Operations of a program or system that do not contribute directly to the solution of a problem but are necessary processing functions, such as checking labels

______t. A high-level programming language designed to provide an easy method of generating routine business reports

______u. Represents magnetic tape file

______v. A program that reads source statements and immediately causes the statements to be executed one at a time

______w. Connects separated portions of a flowchart without drawing lines between the parts

______x. A programming language developed at Dartmouth College for use in academic computing, but now widely used on personal computers and small business systems

______y. Represents the beginning, end, or point of interruption in a program

______z. A computer program used to translate high-level source language programs into machine language programs suitable for execution on a particular computing system

14. RPG
15. Terminal symbol
16. Program flowchart
17. Programming languages
18. BASIC
19. Flowliness
20. Connector symbol
21. High-level programming languages
22. Housekeeping
23. Debugging
24. Interpreter
25. Compiler
26. Magnetic tape symbol

____aa. The form in which data is to appear in a computer printout

____bb. Running of a program or system of programs against representative data to insure the adequacy of the program or system for regular use

____cc. Step-by-step process described in terms of instructions a computer can follow

____dd. Errors which occur when the programmer does not thoroughly understand a phase of the problem, fails to account for all situations that may arise during processing, or misinterprets some steps when coding

____ee. Computer-generated error messages that identify mistakes in coding

____ff. Indicates a change in the form or value of data will occur, or that an operation or process is to be performed

____gg. The illustrations and explanations that should accompany the computer printout of a "working" program that include both general information needed by the user of the program and the specific information needed by the computer operator or by the computer programmer if the program later needs updating

____hh. A series of symbols designed to show the data flow and operational sequence of a system

____ii. A high-level programming language designed to handle the data processing needs of business

____jj. Represents information displayed by on-line printer keyboards, or visual-display units

____kk. Plastic or metallic card containing both system and program flowcharting symbols as cutout forms

____ll. Errors which occur in the coding of the program or when entering the coded program on some input device

27. Testing
28. Data format
29. Logical errors
30. Processing symbol
31. Program
32. Diagnostics
33. COBOL
34. Clerical errors
35. Display symbol
36. System flowchart
37. Documentation
38. Flowcharting template

_____mm. Initial program fed into the computer

_____nn. Source program converted to machine language

_____oo. Language used in COBAL, PL/1, BASIC, for example

39. Object program

40. Source program

41. Source language

2. Select true statements concerning the program development process by placing an "X" in the appropriate blanks.

_____a. The steps in developing a program include: (1) defining the problem; (2) planning the solution; (3) coding the solution; (4) debugging; (5) testing and (6) documenting

_____b. In the system flowchart, emphasis is placed on how the processing is to be accomplished

_____c. The program flowchart serves as a guide in coding a program

_____d. Deck checking is an unnecessary step in the debugging process

_____e. Only valid information is used for testing purposes

_____f. A flowchart may be included in the program documentation

_____g. In testing, the expected results are determined before input

3. Match the following system flowcharting descriptions with their symbols.

_____a. Flowlines

_____b. Punched card deck symbol

_____c. Display symbol

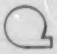
_____d. Magnetic tape symbol

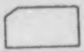
_____e. Document symbol

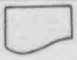
_____f. Storage file

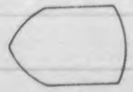
_____g. Manual operation or activity

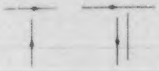
_____h. Conversion from tape to card or vice-versa

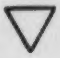
1. 

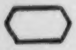
2. 

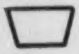
3. 

4. 

5. 

6. 

7. 

8. 

4. Match the following basic program flowcharting descriptions with their symbols.

_____a. Flow direction

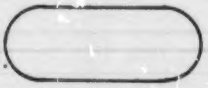
_____b. Processing symbol

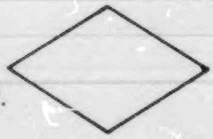
_____c. Terminal symbol

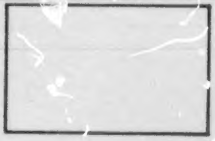
_____d. Decision symbol

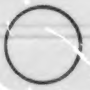
_____e. Input/output symbol

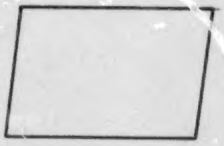
_____f. Connector symbol

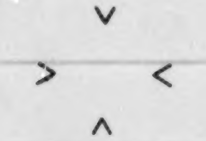
1.


2.


3.


4.


5.


6.


5. Match primary programming languages on the right with their descriptions.

(NOTE: Answers may be used more than once.)

_____a. Includes the statements READ and DATA

_____b. Statements written in English

_____c. A low-level language that can be directly interpreted by the computer

_____d. Designed primarily for interactive computing

1. BASIC
2. Assembler language
3. PL/1
4. RPG
5. Machine language
6. COBOL
7. FORTRAN

______e. Programs are coded on special forms including file description specifications, input specifications, calculation specifications, output specifications, file extension specifications, and line counter specifications

______f. Primarily used with microcomputers and small business computers

______g. Combines some of the concepts of FORTRAN and COBOL

______h. Similar to machine language but uses symbolic names rather than numerical representations of operations

______i. A scientific-mathematical language

______j. Uses codes of 1's and 0's

______k. Divided into four divisions: identification, environment, data, and procedure

______l. High-level language most widely used for business application

______m. Designed to be a simplified business language for small-scale business users for generating routine business reports quickly and easily

______n. Processed by an assembler

6. Solve a problem using the steps outlined in a flowchart.
7. Complete a simple program flowchart.
8. Construct a simple program flowchart.

(NOTE: If these activities have not been accomplished prior to the test, ask your instructor when they should be completed.)

UNDERSTANDING PROGRAMMING CONCEPTS
AND COMPUTER LANGUAGE
UNIT VII

ANSWERS TO TEST

1. a. 4
   b. 6
   c. 2
   d. 7
   e. 1
   f. 10
   g. 5
   h. 12
   i. 3
   j. 9
   k. 13
   l. 8
   m. 11
   n. 17
   o. 16
   p. 23
   q. 19
   r. 21
   s. 22
   t. 14
   u. 26
   v. 24
   w. 20
   x. 18
   y. 15
   z. 25
   aa. 28
   bb. 27
   cc. 31
   dd. 29
   ee. 32
   ff. 30
   gg. 37
   hh. 36
   ii. 33
   jj. 35
   kk. 38
   ll. 34
   mm. 40
   nn. 39
   oo. 41

2. a, c, f, g

3. a. 5
   b. 2
   c. 4
   d. 1
   e. 3
   f. 6
   g. 8
   h. 7

4. a. 6
   b. 3
   c. 1
   d. 2
   e. 5
   f. 4

5. a. 1
   b. 6
   c. 5
   d. 1
   e. 4
   f. 1
   g. 3
   h. 2
   i. 7
   j. 5
   k. 6
   l. 6
   m. 4
   n. 2

6. Evaluated to the satisfaction of the instructor

7. Evaluated to the satisfaction of the instructor

8. Evaluated to the satisfaction of the instructor

INFORMATION PROCESSING SYSTEMS
UNIT VIII

UNIT OBJECTIVE

After completion of this unit, the student should be able to select true statements concerning off-line processing and remote job entry systems. The student should also be able to complete a crossword puzzle using terms associated with information processing systems. This knowledge will be evidenced by correctly performing the procedures outlined in the assignment sheet and by scoring 85 percent on the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms associated with information processing systems with the correct definitions.
2. Select true statements concerning off-line processing.
3. Distinguish between the two types of on-line processing systems.
4. Select true statements concerning the characteristics of remote job entry systems.
5. Complete a crossword puzzle using terms associated with information processing systems.

INFORMATION PROCESSING SYSTEMS
UNIT VIII

SUGGESTED ACTIVITIES

I. Provide student with objective sheet.

II. Provide student with information and assignment sheets.

III. Discuss unit and specific objectives.

IV. Discuss information and assignment sheets.

V. Report on a batch or on-line processing system.

VI. Contact vendors for a report on couplers.

VII. Have a telephone company representative speak on information processing systems or take students on field trip to the telephone offices.

VIII. Give test.

INSTRUCTIONAL MATERIALS

I. Included in this unit:

   A. Objective sheet

   B. Information sheet

   C. Assignment Sheet #1--Complete a Crossword Puzzle Using Terms Associated With Information Processing Systems

   D. Answers to assignment sheet

   E. Test

   F. Answers to test

II. References:

   A. Dock, D. Thomas and Edward Essick. *Principles of Business Data Processing.* Chicago: Science Research Associates, 1978.

   B. Couger, J. Daniel and Fred McFadden. *A First Course in Data Processing.* New York: John Wiley and Sons, 1977.

   C. Spencer, Charles E. *Data Processing: An Introduction.* Columbus, OH: Bobbs Merrill Publishing Co., 1978.

   D. Bohl, Marilyn. *Information Processing.* Third Edition. Chicago: Science Research Associates, 1980.

E. Shelly, Gary B. and Thomas J. Cashman. *Introduction to Computers and Data Processing.* Fullerton, CA: Anaheim Publishing Co., 1980.

F. Orilia, Lawrence S. *Introduction to Business Data Processing.* New York: McGraw-Hill Book Company, 1979.

G. Robichaud, Beryl, Eugene Muscat, and Alix-Marie Hall. *Introduction to Data Processing.* New York: Gregg Division/McGraw-Hill Book Co., 1977.

INFORMATION PROCESSING SYSTEMS
UNIT VIII

INFORMATION SHEET

I. Terms and definitions

A. Off-line processing--Data recorded on a machine-readable medium instead of being transmitted directly to or from the computer

B. Batch processing--The collection and processing of data for a specific time period

C. Input--Means by which data from keyboard, punched cards, punched paper tape, along with magnetic ink characters, printed characters, and other magnetic devices are entered into an information processing system

D. Output--Means by which information is reported from computer storage in a form that can be understood or in a form suitable for use as input for additional processing

E. Punched card--A storage medium in which data is represented by means of holes punched in vertical columns in a paper card

F. Magnetic tape--Medium on which data is recorded in the form of magnetized spots on the surface of magnetically sensitive coated tape

G. Floppy disk--An oxide-coated plastic disk enclosed in a protective covering that can be used for the storage of data

H. Modem--A device that converts data into impulses and transmits them over telephone lines from the terminal to the computer and vice versa

I. Acoustic coupler--A special type of modem that allows a standard telephone headset to be attached to a terminal to allow the transmission of data

J. CPU (central processing unit)--The major component of a computer system responsible for processing all data handled by the system

K. On-line processing--Data transmission directly to or from the CPU

L. Telecommunications--The transmission and processing of data via telephone lines and other high-speed communication means which support on-line processing

M. Real-time processing--An on-line processing system in which data is processed at the time it occurs

N. CRT (cathode ray tube)--A vacuum tube with a screen and a controlled beam of electrons that may be used as a display or a storage device or both

INFORMATION SHEET

O. On-line batch processing--A system in which data is accumulated in batches and transmitted directly to the computer for processing

P. Time share--That which permits many users to simultaneously have access to the same computer system

Q. Remote job entry (RJE)--A device that permits the telecommunication of data to and from a distant computer that can support the input of cards, the output of printed reports, and the use of terminals to input or output data

R. Hard copy--Printed output from an information system

S. Soft copy--Output displayed on a terminal screen

T. Teleprocessing--The telecommunication and processing of data via terminals possessing a visual display capability

U. Network--The physical equipment used to connect one location to another for the purpose of transmitting and receiving information

(NOTE: A network is also known as a communication link.)

II. Off-line processing (Figure 1)

A. Data is collected over a period of time and transmitted from one storage medium to another storage medium

(NOTE: One method of transmitting data from a storage medium is through the use of communication lines and a modem or coupler.)

B. Does not require direct interaction with CPU

C. High reliability

D. Most widely used to handle conventional data processing tasks

Examples: payroll, inventory

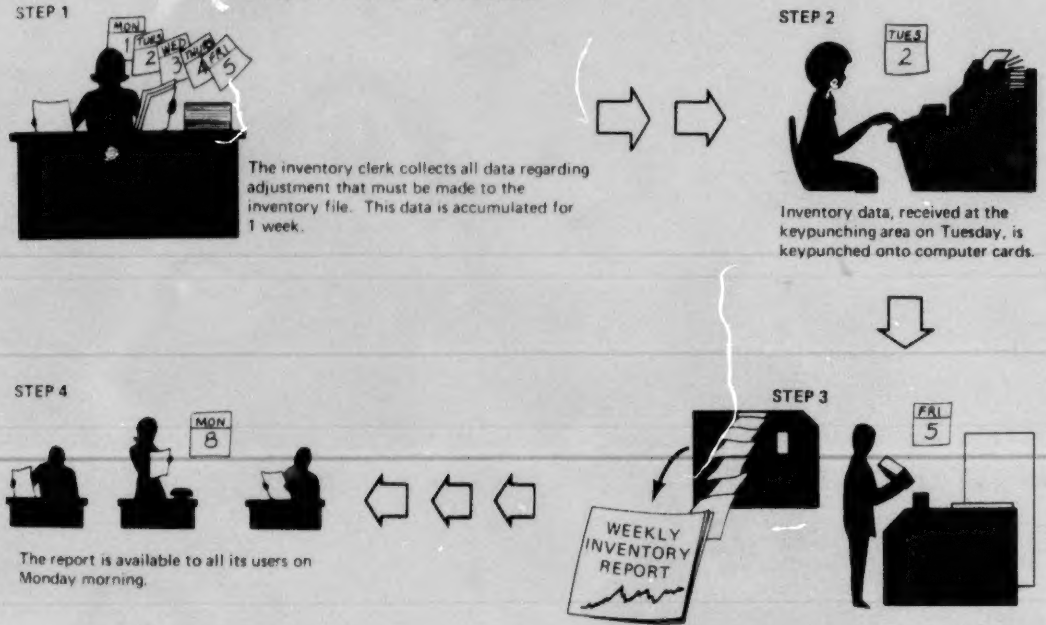
E. Input media

- a. Punched cards
- b. Magnetic tape
- c. Floppy disk

INFORMATION SHEET

F. Batch processing cycle

- a. Source documents gathered for recording
- b. Source documents recorded on input medium
- c. Input verified
- d. Information read into computer from input medium
- e. Computer processes information
- f. Output record is produced



The inventory clerk collects all data regarding adjustment that must be made to the inventory file. This data is accumulated for 1 week.

Inventory data, received at the keypunching area on Tuesday, is keypunched onto computer cards.

The inventory data cards are processed on Friday. The result of updating the inventory data is a new weekly inventory listing.

The report is available to all its users on Monday morning.

Figure 1

The Batch Processing of Inventory Data to Produce a Weekly Inventory Report

From the book *Introduction to Business Data Processing* by Lawrence S. Orilia. Copyright 1979 by McGraw-Hill, Inc. Used with permission of McGraw-Hill Book Company.

III. On-line processing

A. Real-time

1. Requires direct interaction with the CPU
2. Provides almost instantaneous responses

INFORMATION SHEET

3. Highly specialized and very expensive

4. Permits time sharing

5. May involve teleprocessing

   a. Data is transmitted over telephone lines to a computer

   b. Results are transmitted back over lines

   c. Output is displayed on terminal screen

6. Utilizes CRTs

   (NOTE: These are used because information may be visually displayed faster than on hard copy.)

7. Used in applications where processing and the reactions to processed data are critical

   Examples: Car rental agencies, stock exchanges, airlines (Figure 2)

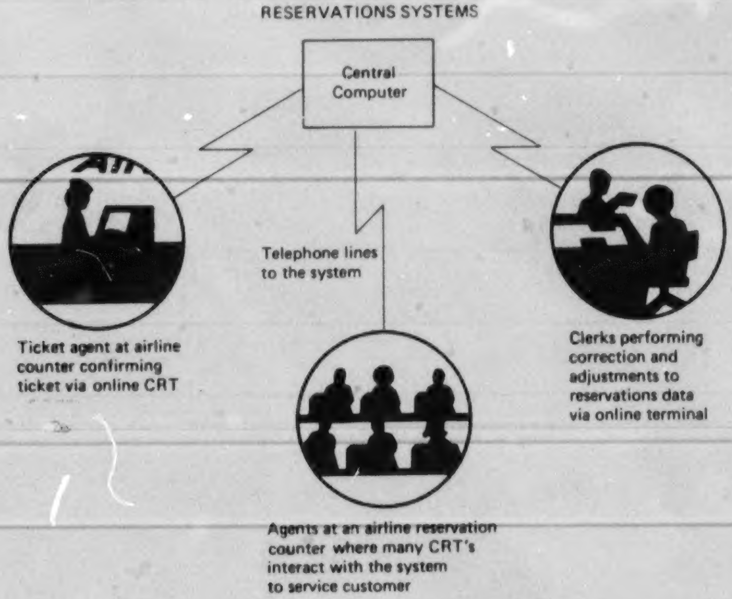

RESERVATIONS SYSTEMS
Central Computer
Telephone lines to the system
Ticket agent at airline counter confirming ticket via online CRT
Agents at an airline reservation counter where many CRT's interact with the system to service customer
Clerks performing correction and adjustments to reservations data via online terminal

Figure 2 An On-Line Real-Time System Handling Air Line Reservations

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(NOTE: The above illustration is an example of a network.)

INFORMATION SHEET

B. On-line batch processing

1. Combination of batch and on-line processing

2. Data accumulated over a period of time

3. Data transmitted to computer at regular intervals

4. Actual processing may be immediate or delayed until computer time is available

5. Accumulation and transmission of data may be done by punched cards or through the use of terminals

   a. When using punched cards, data is collected, and, at a specific time, the information is transmitted to update the file (Figure 3)

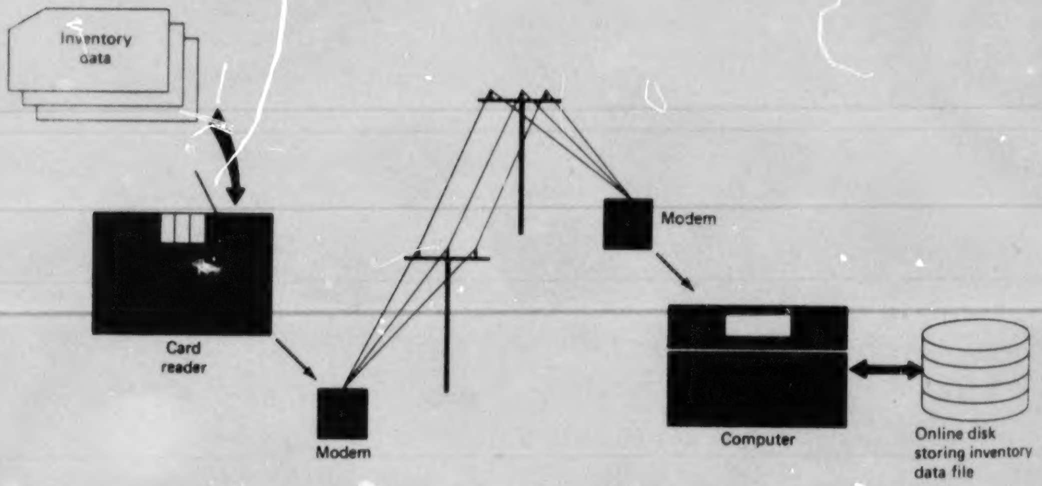

Inventory data
Card reader
Modem
Modem
Computer
Online disk storing inventory data file

Figure 3
The On-Line Batch Processing
of Inventory Data

From the book *Introduction to Business Data Processing* by Lawrence S. Orilia. Copyright 1979 by McGraw-Hill, Inc. Used with permission of McGraw-Hill Book Company.

INFORMATION SHEET

b. When using a terminal, the data is stored in a temporary file, and, when all information is processed, the computer is then directed to the temporary file against the master file (Figure 4)

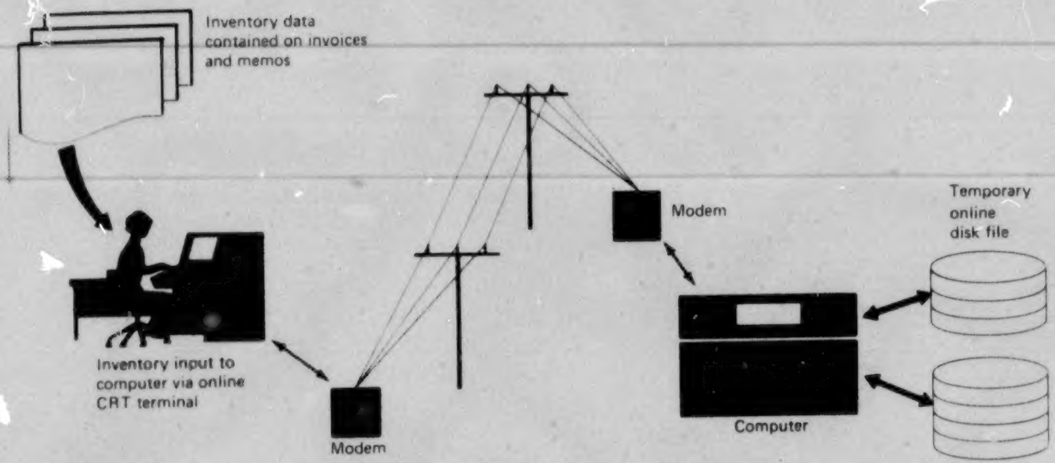

Inventory data contained on invoices and memos
Inventory input to computer via online CRT terminal
Modem
Modem
Computer
Temporary online disk file
Online disk containing inventory file

Figure 4 The On-Line Batch Processing of Inventory Data. The Input of This Data is Accomplished Via an On-Line Terminal. The Clerk Interacts with the System, One Item of Data at a Time, Employing a Conversational Mode.

From the book *Introduction to Business Data Processing* by Lawrence S. Orilia. Copyright 1979 by McGraw-Hill, Inc. Used with permission of McGraw-Hill Book Company.

IV. Remote job entry (RJE)

A. Permits the transfer of information from a remote location through the use of telephone lines to a distant computer system

(NOTE: Sometimes modems are needed.)

B. Input devices

1. Card reader
2. Keyboard for on-line input
3. Tape drive

C. Output form

1. Hard copy (printed reports)
2. Soft copy (terminal screen)

INFORMATION PROCESSING SYSTEMS
UNIT VIII

ASSIGNMENT SHEET #1--COMPLETE A CROSSWORD PUZZLE USING TERMS ASSOCIATED WITH INFORMATION PROCESSING SYSTEMS

Directions: Complete the following crossword puzzle by supplying terms associated with information processing systems that correspond with the definition given.

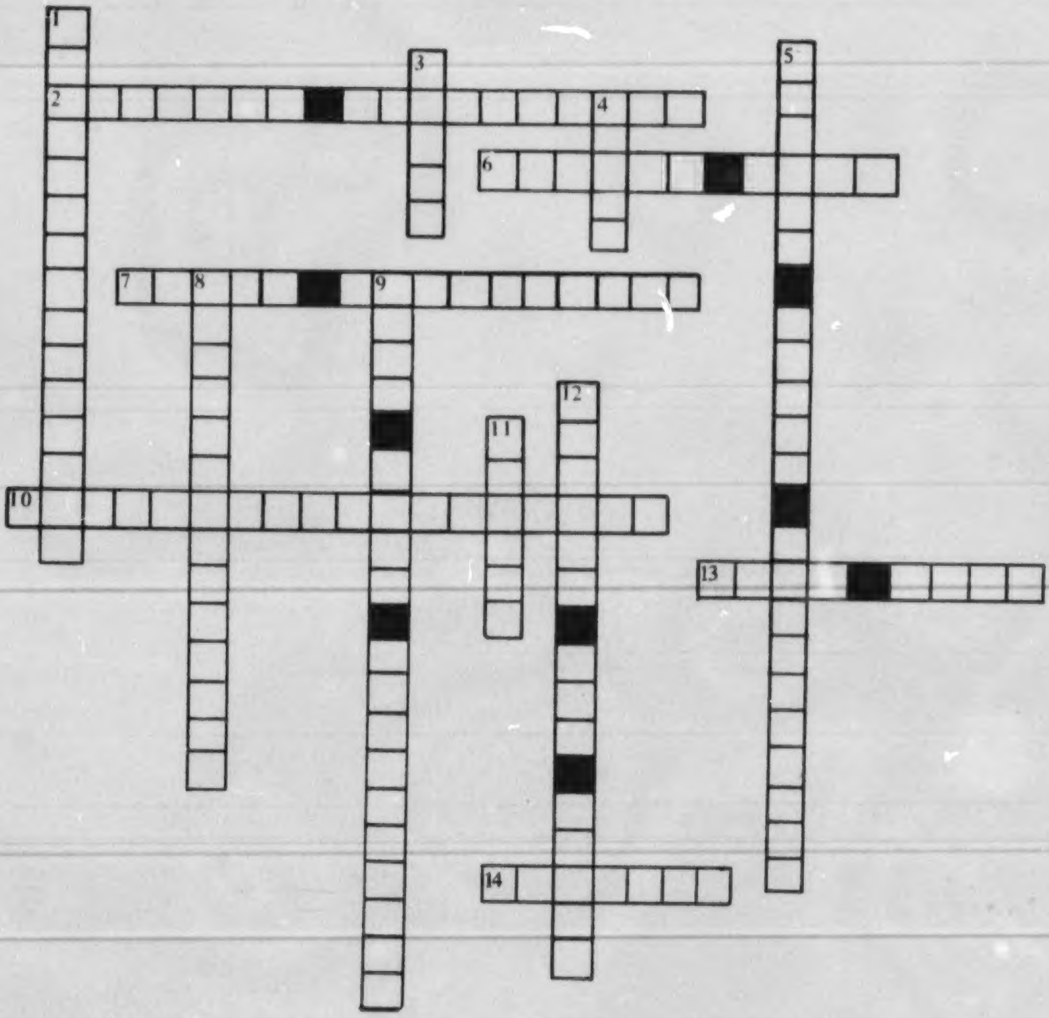
ACROSS

2. Data recorded on a machine-readable medium instead of being transmitted directly to or from the computer
6. An oxide-coated plastic disk enclosed in a protective covering that can be used for the storage of data
7. The collection and processing of data for a specific time period
10. The transmission and processing of data via telephone lines and other high-speed communication means which support on-line processing
13. Printed output from an information system
14. The physical equipment used to connect one location to another for the purpose of transmitting and receiving information

DOWN

1. A special type of modem that allows a standard telephone headset to be attached to a terminal to allow the transmission of data
3. A device that converts data into impulses and transmits them over telephone lines from the terminal to the computer and vice versa
4. Means by which data from keyboard, punched cards, punched paper tape, along with magnetic ink characters, printed characters, and other magnetic devices are entered into an information processing system
5. A system in which data is accumulated in batches and transmitted directly to the computer for processing
8. The telecommunication and processing of data via terminals possessing a visual display capability
9. An on-line processing system in which data is processed at the time it occurs
11. Means by which information is reported from computer storage in a form that can be understood or in a form suitable for use as input for additional processing
12. A device which permits the telecommunication of data to and from a distant computer that can support the input of cards, the output of printed reports, and the use of terminals to input or output data

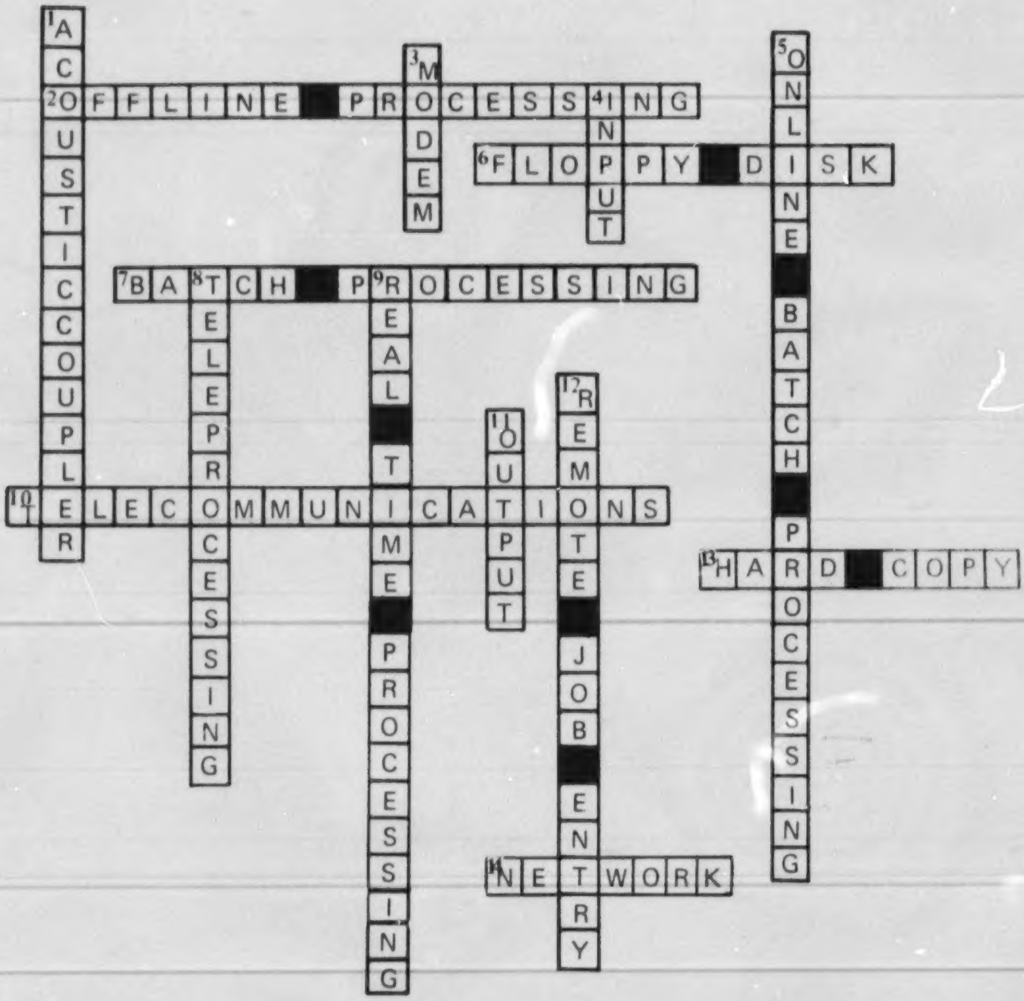
ASSIGNMENT SHEET #1


1
2
3
4
5
6
7
8
9
10
11
12
13
14

(NOTE: There is no space between the words in Answer #1.)

INFORMATION PROCESSING SYSTEMS
UNIT VIII

ANSWERS TO ASSIGNMENT SHEET


1 ACOUSTIC COUPLER
2 OFFLINE PROCESSING
3 MODEM
4 INPUT
5 ONLINE BATCH PROCESSING
6 FLOPPY DISK
7 BATCH PROCESSING
8 TELEPROCESSING
9 REAL TIME PROCESSING
10 TELECOMMUNICATIONS
11 OUTPUT
12 REMOTE JOB ENTRY
13 HARD COPY
14 NETWORK

INFORMATION PROCESSING SYSTEMS
UNIT VIII

NAME ______________________________

TEST

1. Match the terms on the right with the correct definitions.

(NOTE: The terms on this page should be matched with the definitions a through l. Terms and definitions on the following page should also be matched.)

_____a. Output displayed on a terminal screen

_____b. A vacuum tube with a screen and a controlled beam of electrons that may be used as a display or a storage device or both

_____c. A special type of modem that allows a standard telephone headset to be attached to a terminal to allow the transmission of data

_____d. Medium on which data is recorded in the form of magnetized spots on the surface of magnetically sensitive coated tape

_____e. A system in which data is accumulated in batches and transmitted directly to the computer for processing

_____f. An on-line processing system in which data is processed at the time it occurs

_____g. Data recorded on a machine-readable medium instead of being transmitted directly to or from the computer

_____h. The telecommunication and processing of data via terminals possessing a visual display capability

_____i. Means by which data from keyboard, punched cards, punched paper tape, along with magnetic ink characters, printed characters, and other magnetic devices are entered into an information processing system

_____j. Printed output from an information system

_____k. The physical equipment used to connect one location to another for the purpose of transmitting and receiving information

_____l. The transmission and processing of data via telephone lines and other high-speed communication means which support on-line processing

1. Acoustic coupler
2. Soft copy
3. Real-time processing
4. CRT
5. Teleprocessing
6. Hard copy
7. Input
8. Network
9. Magnetic tape
10. Telecommunications
11. Off-line processing
12. On-line batch processing

______m. A device that permits the telecommunication of data to and from a distant computer that can support the input of cards, the output of printed reports, and the use of terminals to input or output data

______n. An oxide-coated plastic disk enclosed in a protective covering that can be used for the storage of data

______o. The collection and processing of data for a specific time period

______p. The major component of a computer system responsible for processing all data handled by the system

______q. A storage medium in which data is represented by means of holes punched in vertical columns in a paper card

______r. That which permits many users to simultaneously have access to the same computer system

______s. A device that converts data into impulses and transmits them over telephone lines from the terminal to the computer and vice versa

______t. Data transmission directly to or from the CPU

______u. Means by which information is reported from computer storage in a form that can be understood or in a form suitable for use as input for additional processing

13. On-line processing
14. Output
15. Punched card
16. CPU
17. Remote job entry
18. Batch processing
19. Modem
20. Floppy disk
21. Time share

2. Select true statements concerning off-line processing by placing an "X" in the appropriate blanks.

______a. Data is collected over a period of time and transmitted from one storage medium to another storage medium

______b. Requires direct interaction with the CPU

______c. Low reliability

______d. Most widely used to handle conventional data processing tasks

______e. Process cycle includes the gathering, recording, and verification of data for input at a later time

______f. Input media include punched cards, magnetic tape, and floppy disk

3. Distinguish between the two types of on-line processing systems by placing an "X" in front of the characteristics of real-time processing.

_____a. Requires direct interaction with the CPU

_____b. Provides almost instantaneous responses

_____c. Highly specialized and very expensive

_____d. Permits time sharing

_____e. Data accumulated over a period of time

_____f. Utilizes CRTs

_____g. Actual processing may be immediate or delayed until computer time is available

_____h. Used in applications where processing and the reactions to processed data are critical

4. Select true statements concerning the characteristics of remote job entry systems by placing an "X" in the appropriate blanks.

_____a. Permits the transfer of information from a remote location through the use of telephone lines to a distant computer system

_____b. Input devices include card readers, keyboard, and tape drive

_____c. Output includes both hard and soft copy

_____d. Output form produces only hard copy

5. Complete a crossword puzzle using terms associated with information processing systems.

(NOTE: If this activity has not been accomplished prior to the test, ask your instructor when it should be completed.)

INFORMATION PROCESSING SYSTEMS
UNIT VIII

ANSWERS TO TEST

1. a. 2
   b. 4
   c. 1
   d. 9
   e. 12
   f. 3
   g. 11
   h. 5
   i. 7
   j. 6
   k. 8
   l. 10
   m. 17
   n. 20
   o. 18
   p. 16
   q. 15
   r. 21
   s. 19
   t. 13
   u. 14

2. a, d, e, f

3. a, b, c, d, f, h

4. a, b, c

5. Evaluated to the satisfaction of the instructor

CAREERS IN INFORMATION PROCESSING
UNIT IX

UNIT OBJECTIVE

After completion of this unit, the student should be able to match terms associated with careers in information processing with their correct definitions and label types of career positions. The student should also be able to draw an organizational chart of a data or word processing installation, respond to organizational questions, research a career area, and evaluate employment skills. This knowledge will be evidenced by correctly performing the procedures outlined in the assignment sheets and by scoring 85 percent on the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms related to careers in information processing with the correct definitions.
2. Label types of career positions on a typical data processing organizational chart.
3. Label types of career positions on a typical word processing organizational chart.
4. Match career titles in data processing with their duties.
5. Match career titles in word processing with their duties.
6. Draw an organizational chart of a data or word processing installation.
7. Respond to organizational questions.
8. Research a career area in information processing.
9. Evaluate employment skills.

CAREERS IN INFORMATION PROCESSING
UNIT IX

SUGGESTED ACTIVITIES

I. Provide student with objective sheet.

II. Provide student with information and assignment sheets.

III. Discuss unit and specific objectives.

IV. Discuss information and assignment sheets.

V. Take a field trip to a word processing installation.

VI. Have a panel discussion with students and personnel administrators concerning careers in information processing.

VII. Have a D.P.M.A. or other student organization dinner.

VIII. Have students use newspaper ads, personal contacts, and other sources to determine possible careers related to information processing which are available in the community. See additional materials below for further sources of information.

IX. Sponsor a career day.

X. To help the students understand the organizational charts in this unit, have them draw an organizational chart for the school system.

XI. Give test.

INSTRUCTIONAL MATERIALS

I. Included in this unit:

A. Objective sheet

B. Information sheet

C. Transparency masters

1. TM 1--Sample Data Processing Organizational Chart
2. TM 2--Sample Word Processing Organizational Chart

D. Assignment sheets

1. Assignment Sheet #1--Draw an Organizational Chart of a Data or Word Processing Installation
2. Assignment Sheet #2--Respond to Organizational Questions

3. Assignment Sheet #3--Research a Career Area in Information Processing

4. Assignment Sheet #4--Evaluate Employment Skills

E. Test

F. Answers to test

II. References:

A. Orilia, Lawrence. *Introduction to Business Data Processing.* New York: McGraw-Hill Book Company, 1979.

B. Bergerud, Marly, and Jean Gonzalez. *Word Processing Concepts and Careers.* New York: John Wiley and Sons, 1978.

III. Additional materials

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CAREERS IN INFORMATION PROCESSING
UNIT IX

INFORMATION SHEET

I. Terms and definitions

A. Installation--A particular word processing or data processing computing system in terms of the work it does and the people who manage, operate, service, apply it to problems, and use the results it produces

B. System library--A collection of software designed to aid the user and/or user program

C. Data base--A data processing system consisting of a group of totally integrated and interactive files to store large quantities of related data

D. User--The recipient of computer services

E. Correspondence center--The room or area housing equipment and personnel for the production of typed documents

F. Administrative support system--Comprises all the nontyping tasks associated with traditional secretarial work carried out under administrative supervision

G. Procedural manual--A booklet containing step-by-step instructions with appropriate illustrations on how to perform a task

H. Principals (word originators)--Individuals within an organization who originate paperwork and require secretarial support

I. Word processing system--The combination of specific procedures, methods, equipment, and people designed to accomplish the transition of a written, verbal, or recorded word distributed to its ultimate use

J. Work measurement--A process of determining how much time is required to do a given amount of work

K. Logging--A method of recording incoming and outgoing work to assist in monitoring and controlling its flow

L. Rough draft--A handwritten or typed copy that is to be revised or corrected or a copy that already has revisions marked on it

M. Magnetic media--Equipment that uses media such as magnetic cards, cassettes, disks, and belts in text-editors, dictation, and data processing equipment to record and store information

INFORMATION SHEET

N. Text-editor--A stand-alone typewriter, with or without a visual display screen, that can revise text

(NOTE: This includes the addition of new material, correction, and the revision of stored material.)

O. Transcribe--To convert recorded data into a typed document or other form of hard copy

II. Career positions in a typical data processing organization (Transparency 1)

A. Data processing manager

B. Data base administrator

C. Systems and programming manager

D. Computer operations manager

E. Data base staff

F. Systems analyst

G. Systems/application programmer

H. Librarian

I. Control analyst

J. Lead computer operator

K. Computer operator

L. Lead keypunch or key entry device operator

M. Keypunch or key entry device operator

III. Career positions in a typical word processing organization (Transparency 2)

A. Manager of correspondence center/administrative support system

B. Correspondence center manager

C. Administrative support center manager

D. Correspondence center supervisor

E. Proofreader editor

F. Administrative support center supervisor

INFORMATION SHEET

G. Lead correspondence secretary

H. Senior correspondence secretary

I. Correspondence secretary

J. Lead administrative support center secretary

K. Senior administrative support center secretary

L. Administrative support center secretary

IV. Data processing career titles and duties

(NOTE: A college degree is required for such positions as data processing manager, data base administrator, and other managers.)

A. Data processing manager--Responsible for the overall planning, organizing, staffing, directing, and controlling of the data processing activity

B. Data base administrator--Manages the administrative staff to insure orderly development of projects, to satisfy data base users, and to plan for future data base requirements

C. Systems and programming manager--Coordinates the overall activities of the systems and applications programmers and is responsible for programming related projects including measurement of progress in relation to predetermined design goals and objectives

D. Systems analyst

1. Collects facts regarding the information requirements of the computer user
2. Analyzes facts
3. Formulates efficient patterns of information flow from its sources to the computer
4. Defines the computer process necessary to turn raw data into useful information
5. Plans the distribution and use of resulting information

E. Systems/application programmer

(NOTE: System programmers develop programs for general use; application programmers develop specific programs.)

1. Prepares a flowchart for each program required in the system designed by the system analyst
2. Codes the logic of the flowchart in the appropriate language

INFORMATION SHEET

3. Debugs and tests the program

4. Provides any additional program documentation required

F. Computer operations manager

1. Coordinates daily activity of the computer installation

2. Provides cross-training and rotation of personnel with emphasis on separation of duties

G. Librarian

1. Controls, stores, and issues data files, programs, and operating procedures for computer processing according to schedule or need

2. Maintains records of the files stored on tape and/or disk for subsequent processing or for historical purposes

(NOTE: The librarian is also responsible for the file purging system and controls the periodic cleaning and conditioning of magnetic tapes and disk packs.)

H. Control analyst

1. Monitors flow of information through the data processing department

2. Performs a variety of clerical jobs

a. Keeps records

b. Notifies users of the computer use schedule

c. Prepares computer use reports

I. Computer operator--Maintains all hardware, logs, journals, and paperwork employed in the daily computerized processing of information

J. Keypunch or key entry device operator--Prepares data for entry into a computer by transcribing data from source documents to either punched cards or magnetic tape or disk

V. Word processing career titles and duties

A. Manager of correspondence center/administrative support system--Coordinates the total system by working closely with supervisors of correspondence center and administrative support system

(NOTE: The manager is also responsible for all office systems, functions, and procedures as well as the development of long-range plans for the correspondence center/administrative support system.)

INFORMATION SHEET

B. Correspondence center manager--Directs the overall operation of the correspondence center

C. Correspondence center supervisor

   1. Coordinates and schedules the daily work flow of the correspondence center

   2. Works with the correspondence center manager in the hiring of personnel, preparation of reports, and training of employees

D. Proofreader editor--Makes the final edit and proofreads work leaving the correspondence center with respect to text content, spelling, punctuation, grammar, and typographical errors

E. Lead correspondence secretary

   1. Gives guidance to other correspondence secretaries on technical or procedural problems

   2. Assists the correspondence center supervisor

F. Senior correspondence secretary--Types special correspondence, reports, and presentations for a variety of different departments and originators

G. Correspondence secretary

   1. Transcribes from shorthand, longhand, rough draft, machine dictation, or printed copy

   2. Types or codes material for machine operation

   (NOTE: Other duties include the keeping of accurate records, filing materials of work completed, photocopying, and assisting with the control of input to the correspondence center.)

H. Administrative support center manager

   1. Directs supervisor(s) in the administrative support center

   2. Develops administrative support systems that are consistent with the organization's goals and objectives

   (NOTE: Other duties include budget preparation, coordination of support services with the correspondence center, hiring, training, and the determination of future human resource needs.)

INFORMATION SHEET

I. Administrative support center supervisor

  1. Reports directly to the administrative support center manager

  2. Guides, trains, and assists all administrative support secretaries

  3. Schedules the work of the administrative support center

  (NOTE: Other duties include the preparation of special reports, recommendation of appropriate staff, and the determination of specific work priorities.)

J. Lead administrative support center secretary

  1. Assists the administrative support center supervisor

  2. Administers work flow to team(s) of administrative secretaries

  (NOTE: The lead secretary performs complex work involving a high degree of initiative, skill, tact, confidence, and service in addition to performing all of the duties of the senior administrative secretary.)

K. Senior administrative support center secretary--Serves as a group leader and schedules work flow for a team of administrative secretaries

L. Administrative support center secretary

  1. Works under general supervision

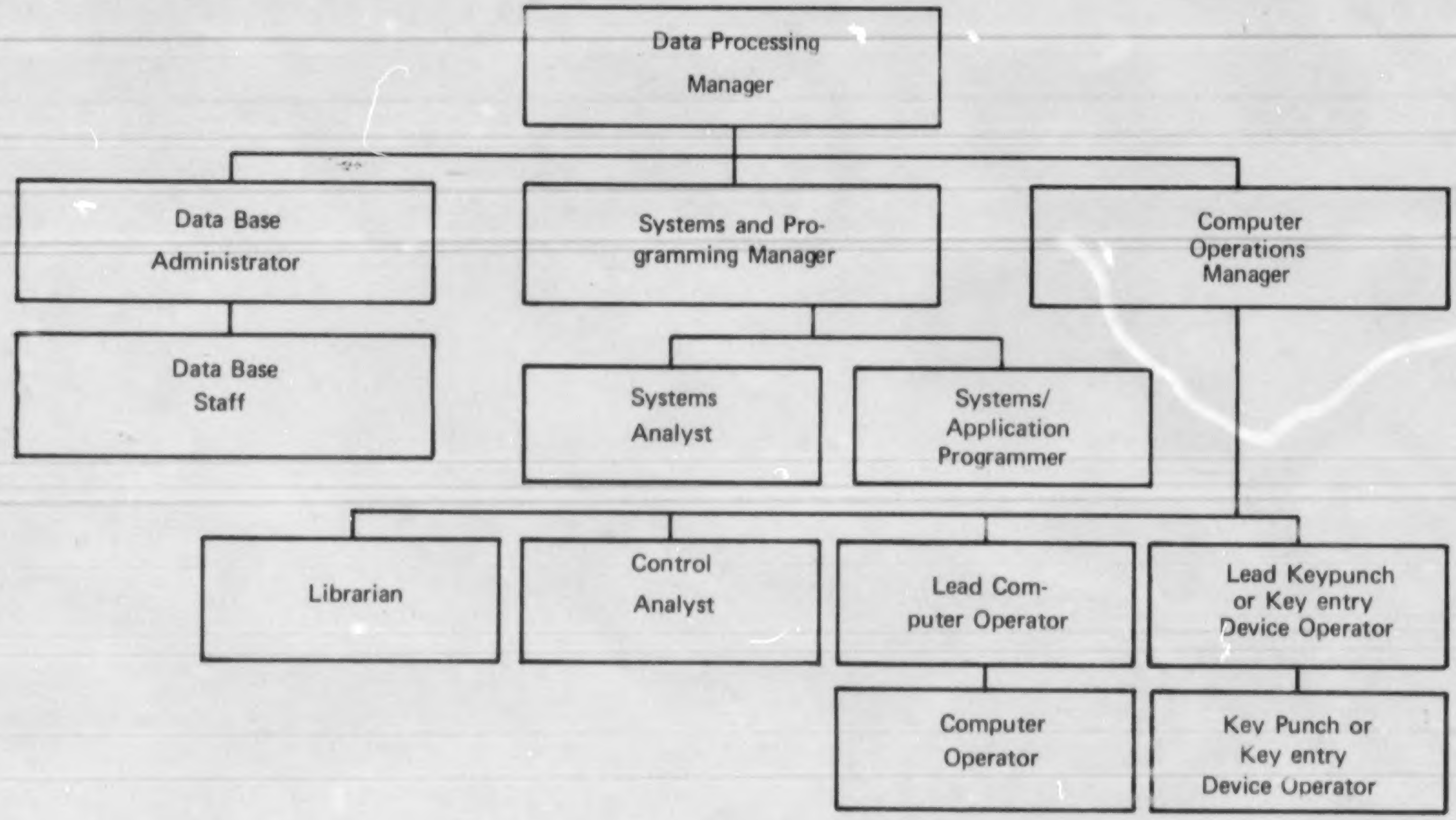
  2. Prepares and dictates general correspondence

  3. Composes work for word originator

  4. Uses correspondence center as a word originator

  (NOTE: Other duties include filing, answering telephone, greeting visitors, handling mail, and scheduling appointments.)

Sample Data Processing Organizational Chart



Data Processing Manager

Data Base Administrator

Systems and Programming Manager

Computer Operations Manager

Data Base Staff

Systems Analyst

Systems/ Application Programmer

Librarian

Control Analyst

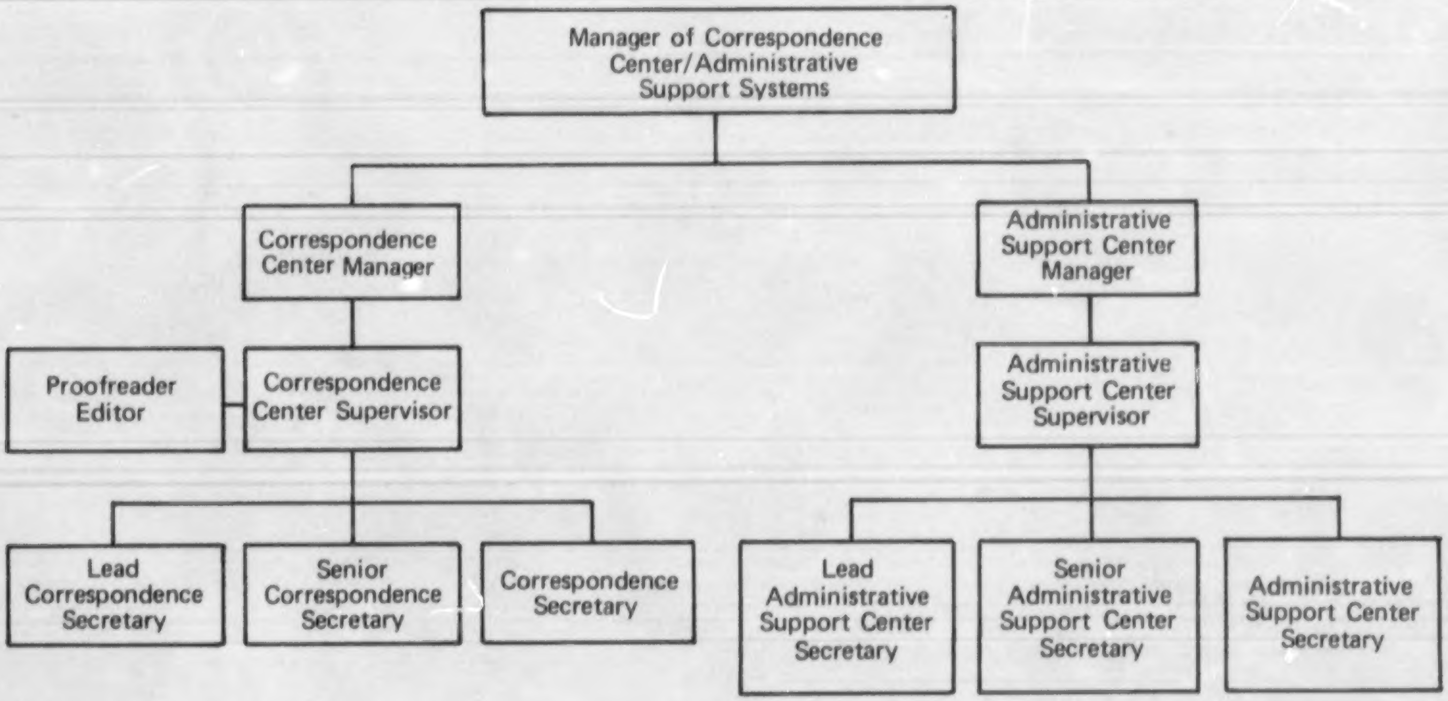
Lead Computer Operator

Lead Keypunch or Key entry Device Operator

Computer Operator

Key Punch or Key entry Device Operator

Sample Word Processing Organizational Chart



Manager of Correspondence Center/Administrative Support Systems

Correspondence Center Manager

Administrative Support Center Manager

Proofreader Editor

Correspondence Center Supervisor

Administrative Support Center Supervisor

Lead Correspondence Secretary

Senior Correspondence Secretary

Correspondence Secretary

Lead Administrative Support Center Secretary

Senior Administrative Support Center Secretary

Administrative Support Center Secretary

CAREERS IN INFORMATION PROCESSING
UNIT IX

ASSIGNMENT SHEET #1--DRAW AN ORGANIZATIONAL CHART OF A DATA OR WORD PROCESSING INSTALLATION

Directions: Tour a data processing or word processing installation and draw an organizational chart of its structure.

(NOTE: If these facilities are unavailable, the school administration or a local business organization can be substituted in order to provide practice in drawing an organizational chart.)

CAREERS IN INFORMATION PROCESSING
UNIT IX

ASSIGNMENT SHEET #2--RESPOND TO ORGANIZATIONAL QUESTIONS

Directions: Using information gained from the information sheets and transparency masters, respond to the following questions.

I. A new correspondence secretary is hired by a large company with a typical word processing organization.

  A. Who hired the secretary?

  B. Who is responsible to see that the secretary is trained?

  C. Who assigns the daily work to be done?

  D. Who does the secretary go to for help if there is trouble with some of the equipment?

II. The company decides to encourage car pooling among the employees. They need a list of all the employees broken down by geographic location. In the data base there is an employee file containing addresses but no program to list them by geographic location.

  A. Who should decide what should be done?

  B. Who will do it?

CAREERS IN INFORMATION PROCESSING
UNIT IX

ASSIGNMENT SHEET #3--RESEARCH A CAREER AREA IN INFORMATION PROCESSING

Directions: Research a career area in data or word processing by using any available job lists, trade journals, or periodicals. Use the following procedures to fill out the charts below.

Step 1. Choose one career area and research job lists for an advertisement in this area. Fill out the following chart on your findings.

a. Job title ____

b. Location ____

c. Background needed:

Experience ____

Education ____

d. Are you qualified now for this job? ____________________

e. Will you be qualified after you complete this course? __________

Step 2. Research this career further by reading trade journals and periodicals and fill out the following chart on your findings.

Career ____

Salary ranges ____

Possibilities for advancement ______________________________

____

Possibilities for travel ______________________________

____

Locations ____

____

Other findings ____

____

____

____

____

CAREERS IN INFORMATION PROCESSING
UNIT IX

ASSIGNMENT SHEET #4--EVALUATE EMPLOYMENT SKILLS

Directions: Rank yourself from 1 to 10 concerning your employment skills for the career in which are you interested. Put these rankings in the blanks to the left of the skills and attitudes. Then, rank the skills according to what you think are necessary for the same job and put these rankings in the blanks on the right. In the remaining blanks at the bottom, suggest ways to improve your weak areas.

Your Rankings	Skills and Attitudes	Necessary Job Skills
_____	Enjoy working with people	_____
_____	Creative	_____
_____	Can accept change	_____
_____	Can handle stress	_____
_____	Able to follow instructions	_____
_____	Can work independently	_____
_____	Can perform tasks required for the job	_____
_____	Can make decisions	_____
_____	A good listener	_____
_____	Can meet deadlines	_____

Ways to improve weak areas ____

____

____

____

____

CAREERS IN INFORMATION PROCESSING
UNIT IX

NAME ______________________________

TEST

1. Match the terms on the right with the correct definitions.

______a. A collection of software designed to aid the user and/or user program

______b. A particular word processing or data processing computing system in terms of the work it does and the people who manage, operate, service, apply it to problems, and use the results it produces

______c. A data processing system consisting of a group of totally integrated and interactive files to store large quantities of related data

______d. The room or area housing equipment and personnel for the production of typed documents

______e. The recipient of computer services

______f. Comprises all the nontyping tasks associated with traditional secretarial work carried out under administrative supervision

______g. Individuals within an organization who originate paperwork and require secretarial support

______h. A booklet containing step-by-step instructions with appropriate illustrations on how to perform a task

______i. The combination of specific procedures, methods, equipment, and people designed to accomplish the transition of a written, verbal, or recorded word distributed to its ultimate use

______j. A process of determining how much time is required to do a given amount of work

______k. A method of recording incoming and outgoing work to assist in monitoring and controlling its flow

1. Correspondence center
2. Magnetic media
3. System library
4. Transcribe
5. Installation
6. Rough draft
7. Principals
8. Work measurement
9. Procedural manual
10. Data base
11. Administrative support system
12. User
13. Word processing system
14. Logging
15. Text-editor

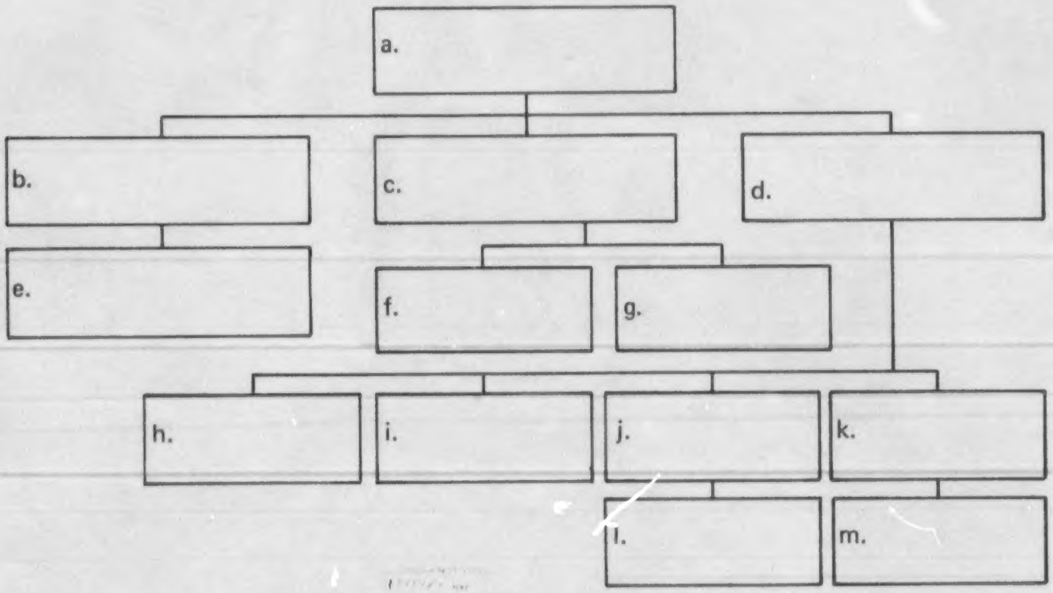
______l. A handwritten or typed copy that is to be revised or corrected or a copy that already has revisions marked on it

______m. To convert recorded data into a typed document or other form of hard copy

______n. A stand-alone typewriter, with or without a visual display screen, that can revise text

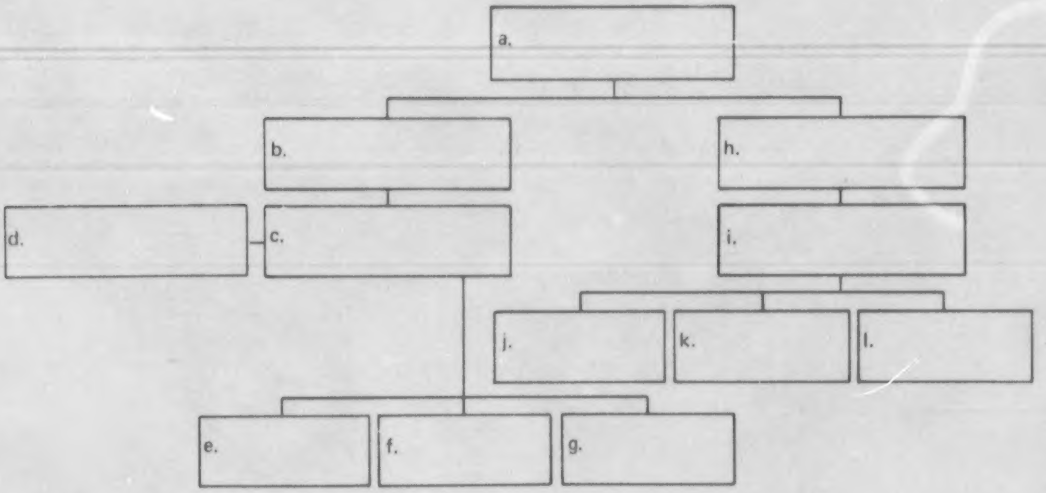
______o. Equipment that uses media such as magnetic cards, cassettes, disks, and belts in text-editors, dictation, and data processing equipment to record and store information

2. Label types of career positions in a typical data processing organization on the chart below by placing the correct number in the appropriate space.



1. Computer operator
2. Librarian
3. Data base staff
4. Data processing manager
5. Keypunch or key entry device operator
6. Control analyst
7. Systems analyst
8. Data base administrator
9. Lead keypunch or key entry device operator
10. Lead computer operator
11. Systems/application programmer
12. Computer operations manager
13. Systems and programming manager

3. Label types of career positions in a typical word processing organization on the chart below by placing the correct number in the appropriate space.



1. Proofreader editor
2. Administrative support center secretary
3. Correspondence secretary
4. Correspondence center manager
5. Senior correspondence secretary
6. Senior administrative support center secretary
7. Administrative support center manager
8. Lead correspondence secretary
9. Correspondence center supervisor
10. Administrative support center supervisor
11. Lead administrative support center secretary
12. Manager of correspondence center/administrative support systems

4. Match career titles in data processing on the right with their duties.

_____a. Responsible for the overall planning, organizing, staffing, directing, and controlling of the data processing activity

_____b. Manages the administrative staff to insure orderly development of projects, to satisfy data base users, and to plan for future data base requirements

1. Computer operations manager
2. Systems/application programmer

______c. Coordinates the overall activities of the systems and applications programmers and is responsible for programming related projects including measurement of progress in relation to predetermined design goals and objectives

______d. Collects and analyzes facts regarding information requirements of the computer user, formulates efficient patterns of information flow from its sources to the computer, defines the computer process necessary to turn raw data into useful information, and plans the distribution and use of resulting information

______e. Prepares a flowchart for each program required in the system designed by the system analyst, codes the logic of the flowchart in the appropriate language, debugs and tests the programs, and provides any additional program documentation required

______f. Coordinates daily activity of the computer installation and provides cross-training and rotation of personnel with emphasis on separation of duties

______g. Controls, stores, and issues data files, programs, and operating procedures for computer processing according to schedule or need, and maintains records of the files stored on tape and/or disk for subsequent processing or for historical purposes

______h. Monitors flow of information through the data processing department and performs a variety of clerical jobs, such as keeping records, notifying users of the computer use schedule, and preparing computer use reports

______i. Maintains all hardware, logs, journals, and paperwork employed in the daily computerized processing of information

______j. Prepares data for entry into a computer by transcribing data from source documents to either punched cards or magnetic tape or disk

3. Data base administrator
4. Computer operator
5. Control analyst
6. Systems and programming manager
7. Data processing manager
8. Keypunch or key entry device operator
9. Librarian
10. Systems analyst

5. Match career titles in word processing on the right with their duties.

______a. Coordinates the total system by working closely with supervisors of correspondence center and administrative support system

______b. Directs the overall operation of the correspondence center

______c. Coordinates and schedules daily work flow of the correpondence center and works with the correspondence center manager in the hiring of personnel, preparation of reports, and the training of employees

______d. Makes the final edit and proofreads work leaving the correspondence center with respect to text content, spelling, punctuation, grammar, and typographical errors

______e. Gives guidance to other correspondence secretaries on technical or procedural problems and assists the correspondence center supervisor

______f. Types special correspondence, reports, and presentations for a variety of different departments and originators

______g. Transcribes from shorthand, longhand, rough draft, machine dictation, or printed copy and types or codes material for machine operation

______h. Directs supervisor(s) in the administrative support center and develops administrative support systems that are consistent with the organization's goals and objectives

______i. Reports directly to the administrative support center manager, guides, trains, and assists all administrative support secretaries, and schedules the work of the administrative support center

______j. Assists the administrative support center supervisor and administers work flow to team(s) of administrative secretaries

______k. Serves as a group leader and schedules work flow for a team of administrative secretaries

______l. Works under general supervision, prepares and dictates general correspondence, composes work for word originator, and uses correspondence center as a word originator

1. Correspondence center manager
2. Lead correspondence secretary
3. Administrative support center manager
4. Correspondence secretary
5. Administrative support center secretary
6. Manager of correspondence center/ administrative support system
7. Lead administrative support center secretary
8. Proofreader editor
9. Senior administrative support center secretary
10. Administrative support center supervisor
11. Senior correspondence secretary
12. Correspondence center supervisor

6. Draw an organizational chart of a data or word processing installation.
7. Respond to organizational questions.
8. Research a career area in information processing.
9. Evaluate employment skills.

(NOTE: If these activities have not been accomplished prior to the test, ask your instructor when they should be completed.)

CAREERS IN INFORMATION PROCESSING
UNIT IX

ANSWERS TO TEST

1.

a.	3	e.	12	i.	13	m.	4
b.	5	f.	11	j.	8	n.	15
c.	10	g.	7	k.	14	o.	2
d.	1	h.	9	l.	6		

2.

a.	4
b.	8
c.	13
d.	12
e.	3
f.	7
g.	11
h.	2
i.	6
j.	10
k.	9
l.	1
m.	5

3.

a.	12
b.	4
c.	9
d.	1
e.	8
f.	5
g.	3
h.	7
i.	10
j.	11
k.	6
l.	2

4.

a.	7	f.	1
b.	3	g.	9
c.	6	h.	5
d.	10	i.	4
e.	2	j.	8

5.

a.	6	d.	8	g.	4	j.	7
b.	1	e.	2	h.	3	k.	9
c.	12	f.	11	i.	10	l.	5

6. Evaluated to the satisfaction of the instructor

7. Evaluated to the satisfaction of the instructor

8. Evaluated to the satisfaction of the instructor

9. Evaluated to the satisfaction of the instructor

INFORMATION PROCESSING: THE PRESENT AND THE FUTURE
UNIT X

UNIT OBJECTIVE

After completion of this unit, the student should be able to select true statements concerning microprocessors, fiber optics, machine shorthand, and electronic mail. The student should also be able to match future trends with their characteristics and report on a future trend. This knowledge will be evidenced by correctly performing the procedures outlined in the assignment sheets and by scoring 85 percent on the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms related to the present and the future of information processing with the correct definitions.
2. Select true statements concerning microprocessors.
3. Name characteristics of the magnetic bubble memory.
4. Distinguish between photodigital and holographic storage.
5. Select true statements concerning the characteristics of fiber optics.
6. Name voice processing systems.
7. Select true statements concerning the characteristics of machine shorthand.
8. Select true statements concerning the characteristics of electronic mail.
9. Describe a cashless society.
10. Match future trends with their characteristics.
11. Report on a future trend.

INFORMATION PROCESSING: THE PRESENT AND THE FUTURE
UNIT X

SUGGESTED ACTIVITIES

I. Provide student with objective sheet.

II. Provide student with information and assignment sheets.

III. Discuss unit and specific objectives.

IV. Discuss information and assignment sheets.

V. An inventory of equipment should be taken within the community to show the utilization of trends mentioned in this unit.

VI. A representative from a firm selling information processing equipment should be asked to address the class on future trends.

VII. Lead a discussion in which the class offers conjectures on future trends.

VIII. Give test.

INSTRUCTIONAL MATERIALS

I. Included in this unit:

  A. Objective sheet

  B. Information sheet

  C. Assignment sheets

    1. Assignment Sheet #1--Match Future Trends with Their Characteristics

    2. Assignment Sheet #2--Report on a Future Trend

  D. Answers to assignment sheets

  E. Test

  F. Answers to test

II. References

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INFORMATION PROCESSING: THE PRESENT AND THE FUTURE
UNIT X

INFORMATION SHEET

I. Terms and definitions

A. Microprocessor--A computer system commonly consisting of a CRT, keyboard, and limited storage, costing less than $10,000.00

B. Magnetic bubble memory--Microscopic spots or regions on a thin film that are magnetized in the direction opposite to that of the surrounding film

C. Silicon chips--Miniature integrated circuits which have replaced transistors

D. Photodigital storage--Associated with optical memory storage, in which lasers record data on chips of film

E. Holographic storage--An advanced data storage technique involving the use of lasers to store data images on plastic plates

F. Hologram--Negative image on a heat-sensitive plastic plate

G. Fiber optics--Technology based upon lightweight, smooth hair-like strands of transparent material used for transmission of data and sound by light waves at high rates of speed

H. Voice processing--The recognition and response to the spoken word

I. Machine shorthand--A machine that enables one keystroke or a combination of keystrokes to represent dictation

J. Computer aided transcription--Transcription of dictated material through the use of the central processing unit

K. Electronic mail--Communications sent electronically over telephone or telegraph lines or relayed by a satellite network

L. Cashless society--Society in which cash is replaced by a credit-card type of medium for the recording of transactions

M. Bill-O-Matic service--Service provided by banks in which a customer may use the telephone to communicate with the computer and to initial bill payments

N. ENTREE card--Plastic card that is used instead of writing checks; money is automatically deducted from a customer's account and credited to the proper merchant

O. Non-volatile memory--System where contents are not lost when power is removed

INFORMATION SHEET

II. Microprocessors

- A. Used primarily in the home
- B. Hardware is more readily available at this time than software
- C. May be purchased in kit form ready to be assembled; fully operational models may also be obtained from retail outlets
- D. Applications
  1. Household budget
  2. Control home heating and air conditioning
  3. Control security systems
  4. Individualized instruction
  5. Household appliances

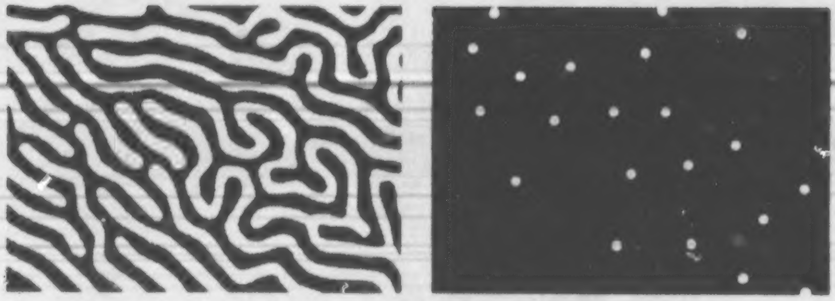
III. Magnetic bubble memory (Figure 1)

- A. Microscopic spots or bubbles stand out from the surface of magnetic film providing a means of storing and accessing data
- B. Storage capacity of each bubble is approximately 70,000 bits
- C. Presence or absence of bubble indicates whether a bit is "on" or "off"
- D. Low power consumption
- E. More reliable than magnetic tape units, magnetic disk units, and other electromechanical storage devices

(NOTE: The magnetic bubble memory is still in development stage but is expected to replace flexible and hard disk storage units.)

INFORMATION SHEET

F. Memory is non-volatile



Before Data is Stored After Data is Stored

FIGURE 1 Magnetic Bubble Memory

Used by permission of John Wiley and Sons, Inc. from *A First Course in Data Processing* by J. Daniel Couger and Fred R. McFadden.

IV. Photodigital and holographic storage

A. Photodigital storage

1. Laser is used to record data permanently on small chips of film

   (NOTE: Chips cannot be reused.)

2. Storage capacity is approximately 13 million bits per inch

   (NOTE: 13 million bits is approximately 1.5 million characters.)

3. Film is read by a flying spot scanner

   Example: Video disks

B. Holographic storage (Figure 2)

1. Laser etches images into surface of a heat-sensitive plastic plate creating a negative image called a hologram

   (NOTE: These plates can be erased and reused.)

INFORMATION SHEET

2. Hologram is read by using a less intense laser light to convert the negative image to digital signals

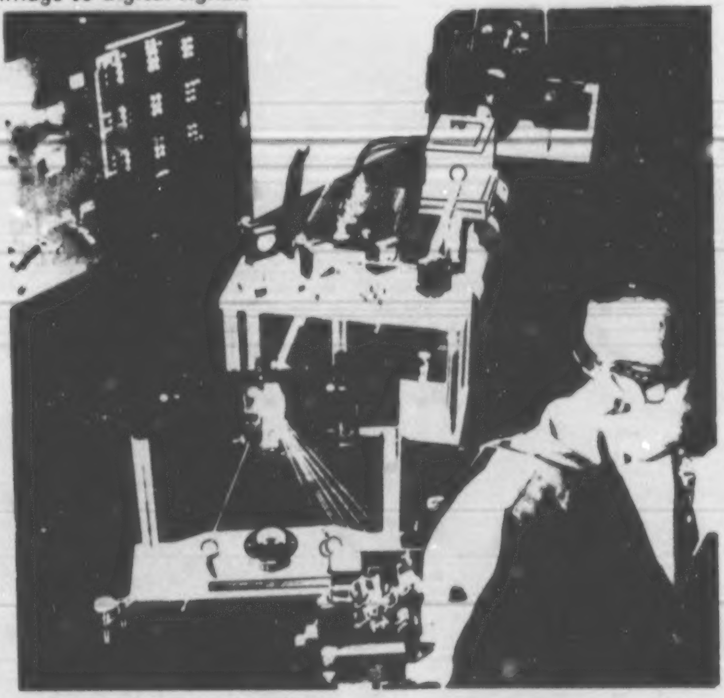


FIGURE 2

Holographic Storage

Courtesy IBM Corporation

V. Fiber optics

A. New method for sending and receiving video, audio, and data by light waves

B. 10 to 80 times smaller than copper or other cables that carry information

C. Permits 1000 times more communication traffic than an ordinary twisted pair of wires the same size

D. High reliability

E. Saves energy

F. Low cost

G. Capable of reading directly from a video screen to create images on paper

VI. Voice processing systems

A. Voice message systems

Example: Telephone answering machine

B. Voice reminder systems--Permits the recording of messages that serve as reminders

INFORMATION SHEET

C. Voice recognition systems–Recognizes a limited vocabulary of human speech

(NOTE: This system is not at this time capable of recognizing continuous speech.)

Example: Child's battery powered car operated by voice commands

D. Synthesized speech from a keyboard--Used by people who are unable to speak

E. Speech recognition systems--Recognizes speech sound patterns

(NOTE: This system is in a developmental state, but the ultimate goal is a system that will keyboard a person's words as they are spoken.)

VII. Characteristics of machine shorthand

A. Keystrokes made on equipment are captured on magnetic tape cassettes and transcribed using Computer Aided Transcription (CAT)

B. System of letters is used to allow the operator to write whole words by depressing one or more keys at a time

C. Revisions are made by using a word/information processor with a screen just as if the information had been keyboarded

D. Allows dictation to be taken at 200 to 230 words per minute

E. Machine is portable

F. Eliminates need to type documents

VIII. Characteristics of electronic mail

A. Communication is sent over telephone or telegraph lines or is relayed by a satellite system

B. Incoming mail may be on video tape and delivered by television

(NOTE: Executives would be able to read their mail on a T.V. screen.)

C. Outgoing mail may be put on microfiche and automatically indexed by a computer

(NOTE: As an alternative to the U.S. Postal Service, this method would virtually eliminate lost or stolen material.)

IX. Cashless society--Enables a consumer to purchase goods and have the payment automatically deducted from his/her account and credited to the merchant's account

Examples: Automatic deposits, ENTREE cards, bill-o-matic services, point-of-sale terminals

INFORMATION PROCESSING: THE PRESENT AND THE FUTURE
UNIT X

ASSIGNMENT SHEET #1--MATCH FUTURE TRENDS WITH THEIR CHARACTERISTICS

Directions: Match the future trends listed at the right with the most appropriate characteristic.

_____a. Computer system commonly consisting of a CRT, keyboard, and limited storage

_____b. Enables a consumer to purchase goods and have the payment automatically deducted from his/her account and credited to the merchant's account

_____c. New method for sending and receiving video, audio, and data by light waves

_____d. Communications sent over telephone or telegraph lines or relayed by a satellite system

_____e. Laser is used to record data permanently on small chips of film

_____f. Is read by using a less intense laser light to convert the negative image to digital signals

_____g. Eliminates need to type documents

_____h. Memory is non-volatile

_____i. Speech recognition system is an example

1. Cashless society
2. Electronic mail
3. Fiber optics
4. Holographic storage
5. Machine shorthand
6. Magnetic bubble memory
7. Microprocessor
8. Photodigital storage
9. Voice processing

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ASSIGNMENT SHEET #2--REPORT ON A FUTURE TREND

Directions:

1. Review materials and resources as suggested by your instructor concerning an information processing future trend not mentioned in this unit.
2. Prepare a written report including such items as:
   a. A description of the trend
   b. An analysis of its applicability for local use
   c. Availability of the item
3. Report your findings to the class

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ANSWERS TO ASSIGNMENT SHEETS

Assignment Sheet #1

a. 7
b. 1
c. 3
d. 2
e. 8
f. 4
g. 5
h. 6
i. 9

Assignment Sheet #2

Evaluated to the satisfaction of the instructor

INFORMATION PROCESSING: THE PRESENT AND THE FUTURE
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NAME ______________________________

TEST

1. Match the terms on the right with the correct definitions.

______a. Communications sent electronically over telephone or telegraph lines or relayed by a satellite network

______b. An advanced data storage technique involving the use of lasers to store data images on plastic plates

______c. Plastic card that is used instead of writing checks; money is automatically deducted from a customer's account and credited to the proper merchant

______d. Miniature integrated circuits which have replaced transistors

______e. A computer system commonly consisting of a CRT, keyboard, and limited storage, costing less than $10,000.00

______f. Service provided by banks in which a customer may use the telephone to communicate with the computer and to initial bill payments

______g. Technology based upon lightweight, smooth hair-like strands of transparent material used for transmission of data and sound by light waves at high rates of speed

______h. A machine that enables one keystroke or a combination of keystrokes to represent dictation

______i. Society in which cash is replaced by a credit-card type of medium for the recording of transactions

______j. The recognition and response to the spoken word

______k. Microscopic spots or regions on a thin film that are magnetized in the direction opposite to that of the surrounding film

1. Bill-O-Matic service
2. Cashless society
3. Computer aided transcription
4. Electronic mail
5. ENTREE card
6. Fiber optics
7. Hologram
8. Holographic storage
9. Machine shorthand
10. Magnetic bubble memory
11. Microprocessor
12. Photodigital storage
13. Silicon chips
14. Voice processing
15. Non-volatile memory

_____l. Associated with optical memory storage, in which lasers record data on chips of film

_____m. Transcription of dictated material through the use of the central processing unit

_____n. Negative image on a heat-sensitive plastic plate

_____o. System where contents are not lost when power is removed

2. Select true statements concerning microprocessors by placing an "X" in the appropriate blanks.

_____a. Used primarily in the home

_____b. Software is more readily available at this time than hardware

_____c. May be purchased in kit form ready to be assembled; fully operational models may also be obtained from retail outlets

_____d. Applications include the preparation of household budgets, the control of home heating and air conditioning, the control of security systems, and individualized instruction

3. Name three characteristics of the magnetic bubble memory.

a. ____

b. ____

c. ____

4. Distinguish between photodigital and holographic storage by placing an "X" next to the characteristics of photodigital and an "O" next to the characteristics of holographic storage.

_____a. Laser is used to record data permanently on small chips of film

_____b. Laser etches images into surface of a heat-sensitive plastic plate creating a negative image

_____c. Read by using a less intense laser light to convert the negative image to digital signals

_____d. Storage capacity is approximately 13 million bits per inch

_____e. Film is read by a flying spot scanner

5. Select true statements concerning the characteristics of fiber optics by placing an "X" in the appropriate blanks.

_____a. New method for sending and receiving video, audio, and data by light waves

_____b. 10 to 80 times larger than copper or other cables that carry information

_____c. Permits 1000 times more communication traffic than an ordinary twisted pair of wires the same size

_____d. Low reliability

_____e. Saves energy

_____f. Low cost

_____g. Capable of reading directly from a video screen to create images on paper

6. Name four voice processing systems.

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

7. Select true statements concerning the characteristics of machine shorthand by placing an "X" in the appropriate blanks.

_____a. Keystrokes made on equipment are captured on magnetic tape cassettes and transcribed using Computer Aided Transcription (CAT)

_____b. System of letters is used to allow the operator to write whole words by depressing one or more keys at a time

_____c. Revisions are made by using a word/information processor with a screen just as if the information had been keyboarded

_____d. Allows dictation to be taken at 300 to 400 words per minute

_____e. Machine is portable

8. Select true statements concerning the characteristics of electronic mail by placing an "X" in the appropriate blanks.

_____a. Communication is sent over telephone or telegraph lines or is relayed by a satellite system

_____b. Incoming mail is delivered by letter carriers

_____c. Outgoing mail may be put on microfiche and automatically indexed by a computer

9. Describe a cashless society.

____

____

10. Match future trends with their characteristics.

11. Report on a future trend.

(NOTE: If these activities have not been accomplished prior to the test, ask your instructor when they should be completed.)

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ANSWERS TO TEST

1. a. 4
   b. 8
   c. 5
   d. 13
   e. 11
   f. 1
   g. 6
   h. 9
   i. 2
   j. 14
   k. 10
   l. 12
   m. 3
   n. 7
   o. 15

2. a, c, d

3. Any three of the following:

   a. Microscopic spots or bubbles stand out from the surface of magnetic film providing a means of storing and accessing data

   b. Storage capacity of each bubble is approximately 70,000 bits

   c. Presence or absence of bubble indicates whether a bit is "on" or "off"

   d. Low power consumption

   e. More reliable than magnetic tape units, magnetic disk units, and other electromechanical storage devices

   f. Memory is non-volatile

4. a. X
   b. O
   c. O
   d. X
   e. X

5. a, c, e, f, g

6. Any four of the following:

   a. Voice message
   b. Voice reminder
   c. Voice recognition
   d. Synthesized speed from a keyboard
   e. Speed recognition

7. a, b, c, e

8. a, c

9. Enables a consumer to purchase goods and have the payment automatically deducted from his/her account and credited to the merchant's account

10. Evaluated to the satisfaction of the instructor

11. Evaluated to the satisfaction of the instructor